

•COMPLETE
ILLUSTRATED
INSTRUCTIONS
for INSTALLING

HERCULES STEAM AND HOT WATER Heating Systems

SEARS, ROEBUCK and CO.

THE WORLD'S LARGEST STORE

START HERE . . . READ CAREFULLY

You have purchased a first class heating plant . . . install it in a first class manner to get long time dependable service. Follow these instructions carefully . . . study your blue prints . . . and the result will fulfill all of your expectations.

When Your Shipment Arrives

In case of damage or shortage of any part of your order, have the freight agent make a notation of such damage or shortage on your freight bill at the time of receiving goods. Have him also furnish you with a copy of his inspection report form. **Send both the freight bill and inspection report to us.** If damage or shortage is not discovered until unpacking the shipment at home, request the agent to call and make an inspection.

When you get the material delivered to your home, unpack the boxes carefully, and be sure that none of the small parts are thrown out with the excelsior.

After you have the boxes unpacked, and the contents carefully removed and sorted out, check the entire shipment in detail against the itemized checking list, which we have sent to you, so as to make sure that you have received all parts.

KNOW THESE IMPORTANT PARTS OF YOUR PLANT

The illustrations below show important heating plant parts which will be frequently referred to in the instructions which follow. Not all are used on any one plant but you should know both the name and the purpose of those used on your system.



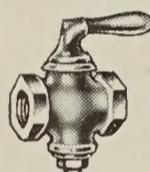
Tees and Reducing Tees

Used to connect three pieces of pipe when you want to run a side branch from main line. Openings in Reducing Tees are of various diameters, the largest end opening is first given, then the opposite end and then side, as $2 \times 2 \times 1 \frac{1}{2}$ in.



Pipe Unions

Used to join together two pieces of pipe, where the other ends of pipe are already connected.



Stop Cock

Used on supply pipe near boiler to let water into boiler when connected to running water supply.



Automatic Air Valve

Made with micrometer precision. Used to vent air from steam mains. One placed at end of each main. Permits air to escape but closes against steam. Entirely automatic.



Elbows and Reducing Ells

A 90 degree elbow makes a one-quarter or right angle turn; a 45 degree elbow makes a one-eighth turn. Regular elbows have same size openings at both ends. Reducing elbows have different size openings, the larger is always first, as $2 \times 1 \frac{1}{2}$.



Pipe Nipples

Short pieces of pipe, threaded at both ends. Furnished in assorted sizes for convenience in making connections.



Drain Cock

Used at base of boiler. When opened it allows water to be drained out of system when necessary.



Automatic Siphon Air Valve

This type air vent used on steam radiator to permit air to escape. The heavy drop forged brass base guards system from heat stealing air pockets. Lets air out instantly, but locks tight against outside air.



45 Degree Elbows

Similar to 90 degree elbows, but have a shorter turn as you can readily see by comparing the illustrations. Used on heating plants chiefly for branch lines near where they take off from mains.



Flange Unions

Used for making connections in main pipe near the boiler.



Floor and Ceiling Plates

One encircles each pipe at floor and ceiling. Covers the part of the hole not occupied by pipe.



Radiator Valves—Steam

One used on each steam radiator. A steam radiator valve should be either wide open or closed tight. Always make sure of this.



Union Elbows

Union elbows are used to connect the radiator on hot water heating systems. This fitting is exposed to view, being above the floor, hence the reason for it being nickel plated.



Plugs and Bushings

Plugs used to "stop" openings.



Bushings: Used for reducing pipe sizes.



Compression Air Valve

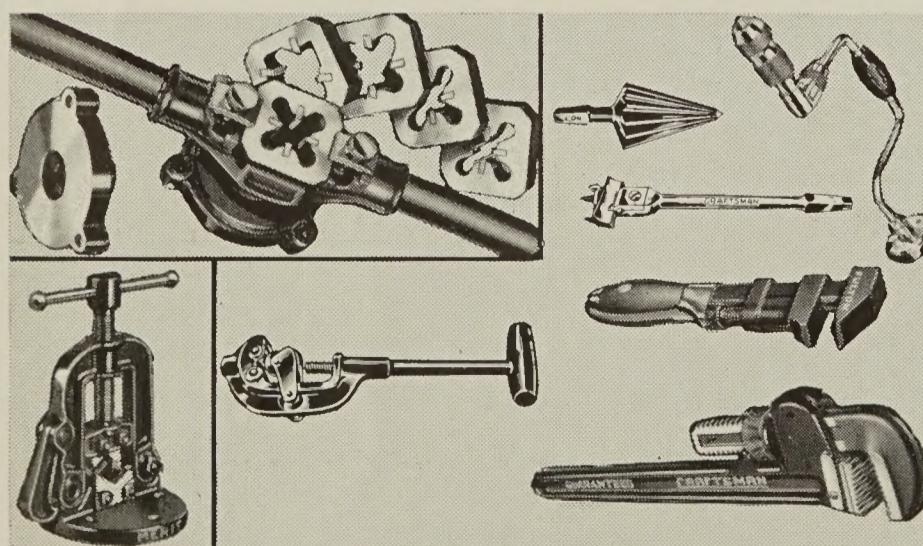
One used on each hot water radiator to release air from radiator. A small key is provided for opening and closing air valves.



Radiator Valve—Hot Water

One used on each Hot Water radiator. Regulates radiator heat when system is in operation, by allowing water to flow through radiator, or by stopping water entirely.

YOU WILL NEED THESE PIPE FITTING TOOLS



For installing your system properly you will need the following special tools:

1. No. 2 Pipe Stock and Dies.
2. Pipe Vise.
3. 18-inch Pipe Wrench.
4. 24-inch Pipe Wrench.
5. No. 2 Pipe Cutter.
6. Burring Reamer (furnished with your heating plant).
7. Brace and Expansion Bit.
8. Plumb Line (or its equivalent).

If you haven't the first five of these tools and cannot borrow them from a neighbor, Sears will lend them to you. A deposit of \$17.50 is required. Upon return of the tools, freight prepaid, and in the same good condition as sent, your deposit will be returned.

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How to Read Your Blue Print

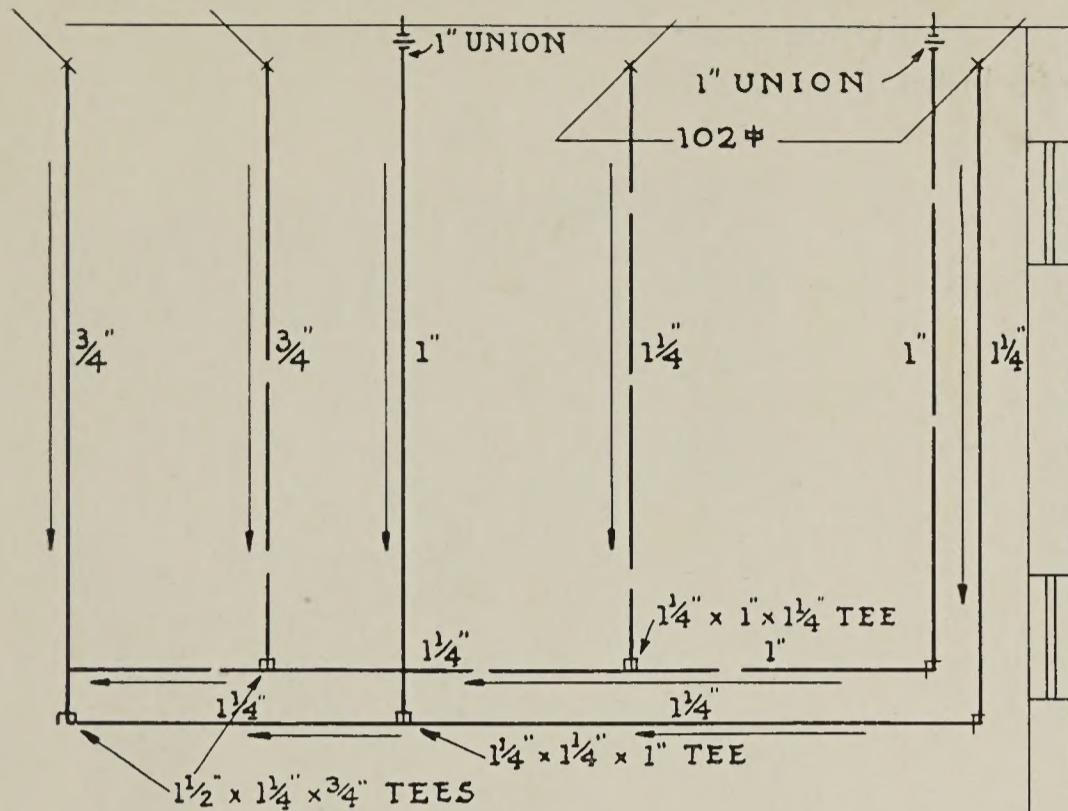


Figure 1

This Instruction Book merely supplements your Blue Prints. The Blue Prints are made-to-order plans for your heating plant, drawn by competent engineers. Study them, follow them step by step. At the left we show a section of a blue print. Numbers along pipe length, as 1 1/2-inch, indicates the diameter of the pipe.

Wherever two pipes are joined the connection, whether reducing elbow, tee, or union etc., is indicated by an arrow and the dimensions and kind of connection plainly given at the opposite end of the arrow.

The section of blue print illustrated at the left shows how the pipes and fittings are indicated.

A symbol as shown (rectangle with a vertical line through it) is used to indicate the square feet of radiating surface. Risers and the radiators to which they connect are indicated by the same radiating surface being indicated for both. The number 102 at left would, on the upper floor plan, again show opposite the radiator to which the pipes connect.

By reference to the heating plant parts on page 2 you will find the blue print of the boiler and its connections self explanatory. On the blue print, the heating system is shown by the broadest white lines; walls, partitions and dimensions in thinner and fainter white lines.

Simple Pipe Fitting

A full 80 per cent of installing your heating system is simple pipe fitting—simple if you make it so by faithfully following these instructions.

Main pipes are cut to size and threaded before shipment; branch line pipes must be cut from the random lengths sent you and threaded.

In cutting the threads on branch lines, put plenty of oil on the pipe where the threads are being cut. This makes the die work freely. Don't turn the die stock continuously, rather turn it up about one full turn, then work it back and forth a few times before giving it another turn.

If you do this, you will find that the die will work much more freely and you will cut a better thread. When placing a die in the stock be careful to see that the large side of the taper is toward the pipe and that the guide in the opposite side of the stock is changed to correspond with the size die you are using. Each time you finish threading a piece of pipe, rap the die stock against the bench a couple of times with the die face downward so as to knock out all shavings, and the die will be clean to start the next thread.

Ream All Threads After Cutting



Figure 2



Figure 3



Figure 4

When you cut a piece of pipe, a burr is left by the cutter wheel, as shown in the upper illustration, Figure 2. This reduces the capacity of the pipe, and this burr should, in all cases, be completely reamed out with a pipe reamer after threading, so that there will be no interference with the circulation of the steam or water in the pipe. The center illustration, Figure 3, shows how the reamer is used. It is turned with an ordinary bit brace. The lower illustration, Figure 4, shows the end of the pipe after being reamed.

Use Pipe Joint Compound Liberally

In your shipment of material you receive a sufficient quantity of pipe joint compound. Use this liberally on all connections. It

seals the joints to make them leak-proof. However, it is best, and especially so on steam jobs, that this compound be spread on outside threads of the pipe only and not in the fitting. When compound is placed in the fittings some of it is pushed through ahead of the pipe. This adds to the grease and dirt to be removed later.

Inspect Each Pipe Before Use

Before using each piece of pipe, inspect it carefully to see that there is no foreign matter inside, such as waste, dirt, paper or anything that would obstruct the flow of water.

A stoppage in a length of pipe can be detected by holding one end of the pipe toward the light and looking through from the other end.

Be sure that each piece of pipe is tightly screwed into the fitting before the next piece of pipe is put on. Be sure that elbows and tees face in the right direction when pipe connection is made up tight.



Figure 5

Use plenty of pipe compound on joints. Place on outside threads only.

Temporary Support for Mains

While putting in the main feed and return pipes it is best to hold them in position by means of temporary wires or wood supports, so the position of the pipe can be easily shifted when connecting the branches to the feed and return mains. After all the pipe has been placed in position the regular hangers furnished with the plant should be used for supporting pipes to the basement ceiling, and the wood supports or wires removed.

These pipe hangers consist of a ring to fit around the pipe, a piece of perforated strap iron and a lag screw. This strap iron is of soft metal and can easily be cut to the proper length. At the highest part of the main short hangers will be needed. As the main drops, longer lengths will be used. If any hangers are not long enough, the pieces cut from the short hangers can be added to the others by means of stove bolts.

Connecting Mains to Boiler

Instructions for Assembling the Boiler are Packed With Each Boiler.
Follow These Instructions Carefully.

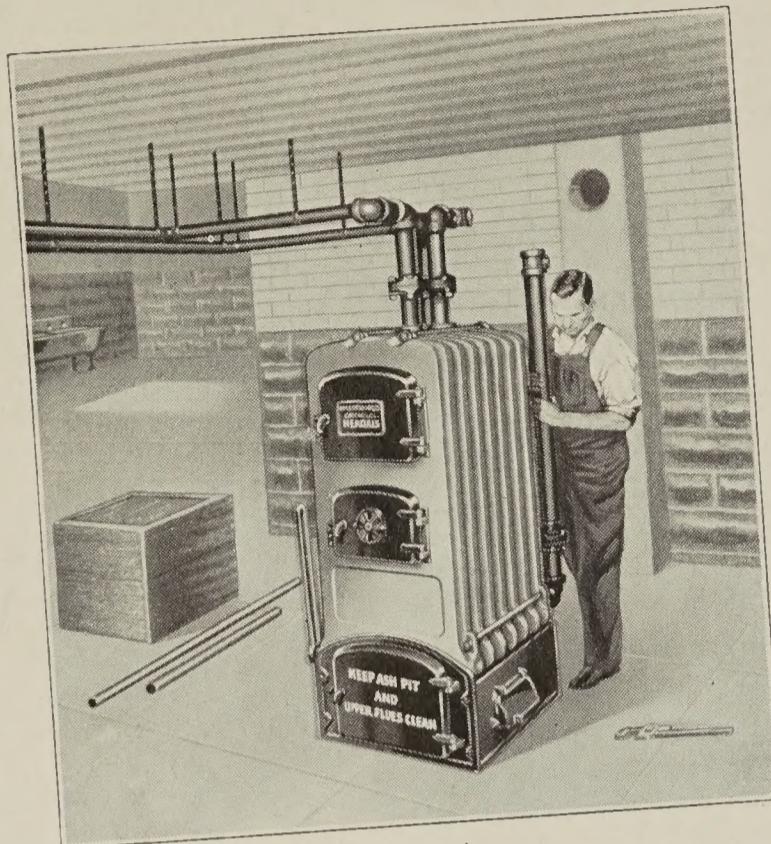


Figure 6

Notice the position of the flange unions on the riser mains and return pipe. Always start at the boiler when installing piping.

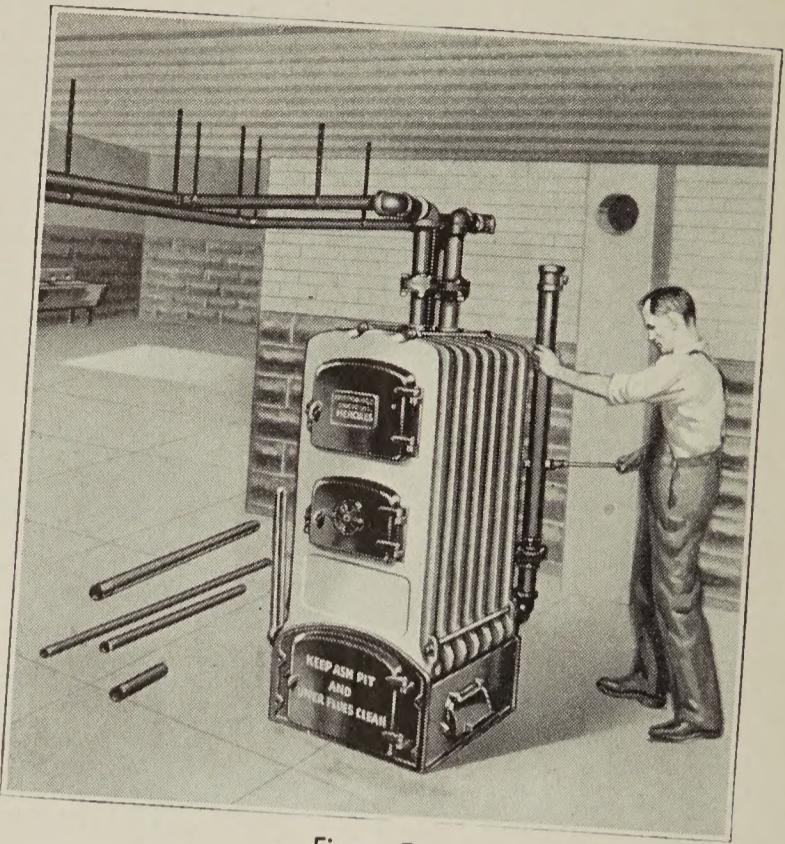


Figure 7

Be sure that each piece of pipe is screwed tightly into the fitting before the next piece is put on. Be sure that elbows and tees face in right direction when connection is made up tight.

Figure 6 and Figure 7 illustrate the method of connecting the feed and return mains to the boiler. Flange unions (Figure 9) are placed near the boiler so the pipes can be disconnected if desired without unscrewing all of the piping in the system or breaking a fitting, which would be necessary were these unions not used.

The return mains are connected to the boiler in the following manner. An 8-inch nipple is screwed in the boiler tapping, a 90-degree elbow connected to the nipple and then a 6-inch nipple and the flange union, as shown in the illustration (Figure 6). The feed main pipes are connected to the boiler by screwing a 6-inch nipple into the top tappings, and then connecting the flange unions to these nipples. To pack the flange unions, use the rubber gaskets furnished with the plant, or make a gasket out of ordinary cardboard and give it a coating of pipe cement. Insert this gasket between the two halves of the flange union and screw the bolts down tight.

The lengths of pipe for the remainder of the main lines are shown on the working drawing. Start piping the system at the boiler and lay out the pipe in the manner shown on the working plan.

The tees in the main lines, to which the branch pipes leading to the radiators connect, should be pitched at an angle of 45 degrees. Turning the tees slightly upward gives the desired pitch. Into the side opening of the tee a close nipple is placed, and then a 45-degree elbow. This will give you a right angle connection. A swing joint is provided at the top of the boiler riser, to enable you to get the above pitch to your main pipe.

Riser connections, which are not made until after radiators are in place and holes bored for the risers, will be discussed in detail under *Installing Your Hot Water System*, and *Installing Your Steam Heating System*—as the procedure for these systems differs slightly.

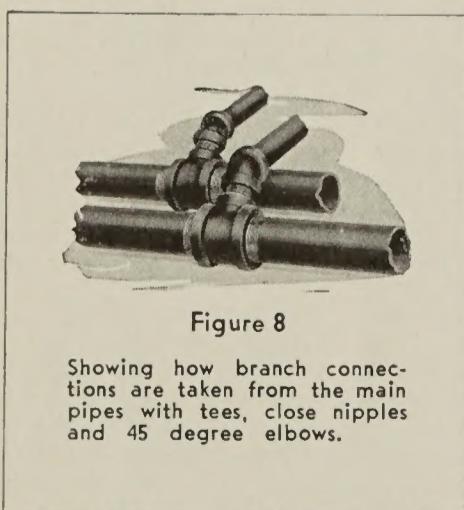


Figure 8

Showing how branch connections are taken from the main pipes with tees, close nipples and 45 degree elbows.

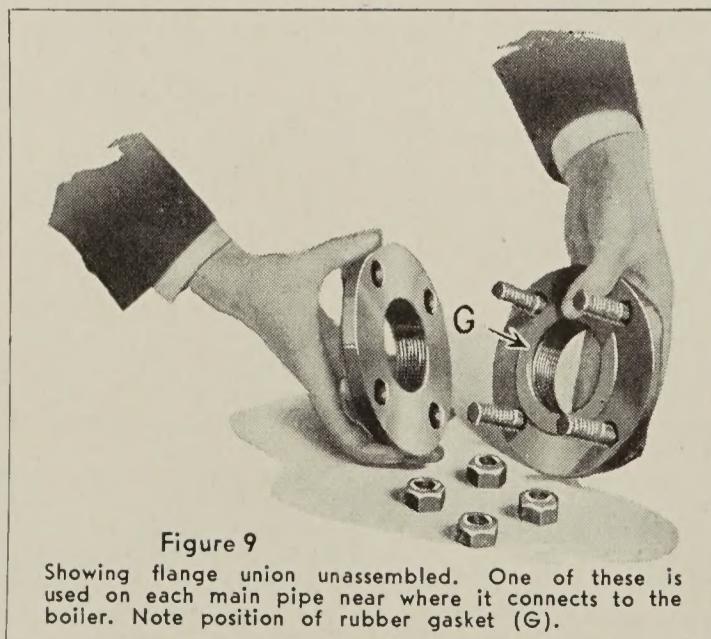


Figure 9

Showing flange union unassembled. One of these is used on each main pipe near where it connects to the boiler. Note position of rubber gasket (G).

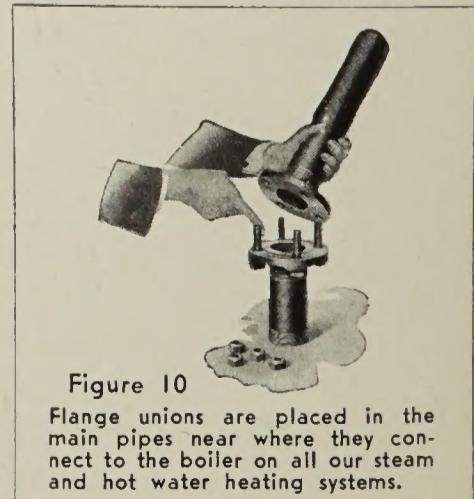


Figure 10

Flange unions are placed in the main pipes near where they connect to the boiler on all our steam and hot water heating systems.

Hercules Heating Systems

Putting Radiators into Position

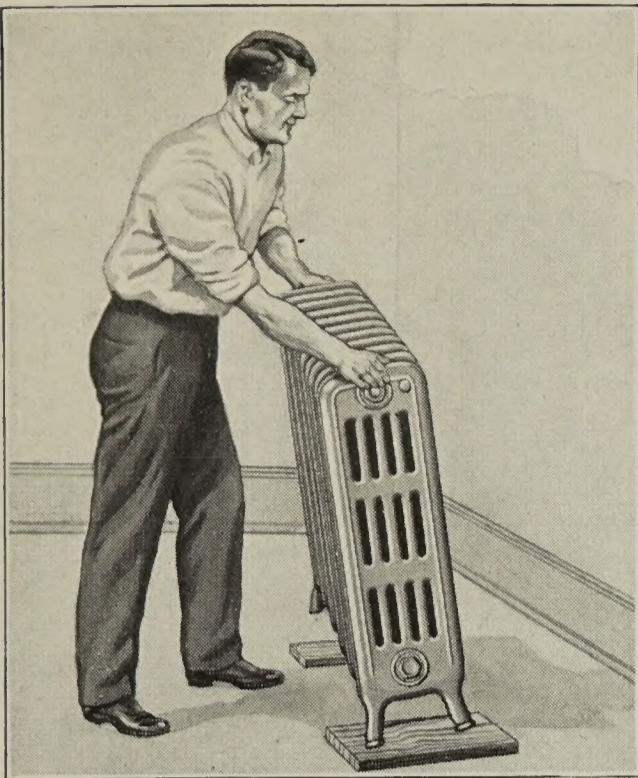


Figure 11
"Walking" a radiator without scratching floors.
Note small boards under legs.

After you have assembled the boiler the next thing to do is to place the radiators in the different rooms at the points indicated on the working plan. We always try, wherever practical, to locate the radiators along the outside walls preferably under windows so that they will come in the coldest part of the room, thereby maintaining a more even temperature at all points.

At each place where a radiator is shown on the plan you will find the size of the radiator marked. These markings are interpreted as follows: The first number indicates the number of sections that the radiator contains. The second figure indicates the height of the radiator, and the last figure indicates the number of tubes. For instance, the radiator marked 7-38-3 on the blue print plan would mean that a seven section 38-inch three-tube radiator should be placed in the position shown.

Be very careful in distributing the radiators to make sure that you are getting the right radiator in the right room.

Second floor radiators are not always shown on the plan, but the points where the risers leading to these second floor radiators come up are indicated, and at the point where these risers are shown the size of the second floor radiator to which these risers connect is given, so that you can easily tell which radiator goes in each of the second floor rooms.

In moving the radiators over your floors, it is a good idea to have a few smooth boards which you can put under the legs to keep from scratching your floors. When radiators do not contain too many sections they can be moved quite easily by turning them at an angle off the floor and using one of the legs as a swivel, as shown in Figure 11. With the use of the small boards referred to above, placing them between the leg of the radiator and the floor you can "walk" the radiator with little effort as shown.

Radiators containing a large number of sections can be more easily handled by standing them on a plank and using wooden rollers under the plank. An old wooden curtain pole sawed up into short pieces will be found convenient for this purpose.

Boring Holes for Radiator Pipes

To find the correct point at which to bore the hole through the floor for the pipe leading to the radiator, first attach the valve to the radiator as explained below and then set the radiator in the position that you want it; directly below the center point of the radiator valve, mark on the floor the exact point to drill the holes as shown in Figure 12. The spud of the valve is the part that screws into the radiator. This can be detached from the valve by unscrewing the coupling nut or union. When you unscrew this union, and remove the spud and coupling from the valve, you will notice two small lugs or projections on the inside of this spud. These lugs are used to tighten the spud into the radiator. Coat the threads on the spud with white lead or joint compound, and turn it loosely into the radiator bushing.

Have the coupling in position on the spud before tightening up the spud to the radiator, otherwise you will have to unscrew it again to put the coupling in place. Insert a flat piece of steel about the shape of an ordinary file into the spud.

Figure 12
Correct method of marking
floor for radiator connections.

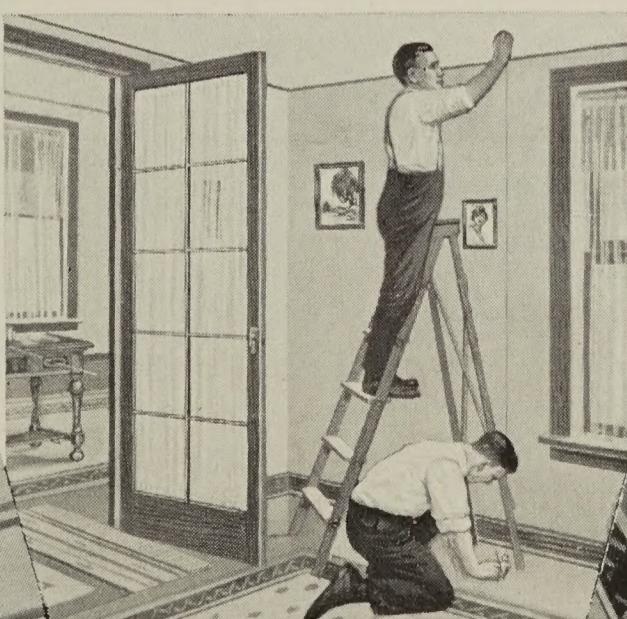


Figure 13
Drop plumb line from second floor hole to
mark first floor riser holes.

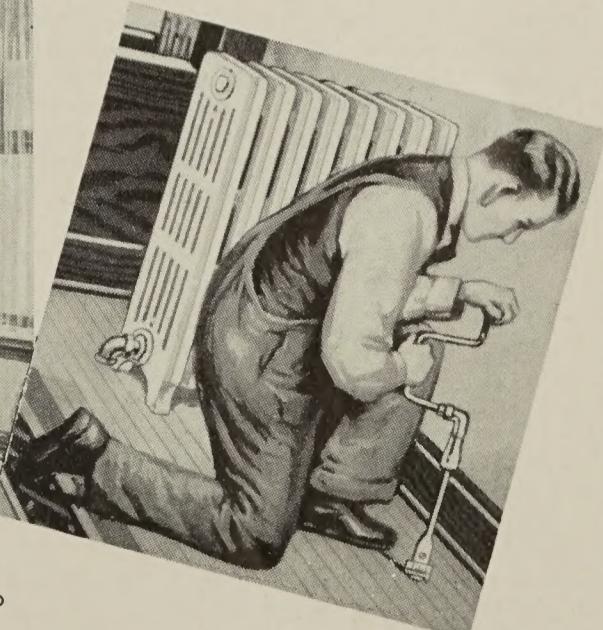
By putting a monkey wrench on this piece of flat steel you can turn the spud up tight into the radiator bushing without putting the jaws of the pipe wrench on it.

Where the valves are not too large, the flat steel end of a pipe wrench can be inserted in the spud and then turned with a monkey wrench in the same manner as above. Do not put the sharp jaws of a pipe wrench on the nickel plated spuds of the radiator valves, as it will mar them.

In determining the center point beneath the valve, as shown in Figure 12, do not interfere with any of the joists underneath the floor. These holes should come about midway between the joists. The position of the joists underneath the floor can be determined by sounding with a hammer or driving fine nails.

Radiators are usually placed so that a 3-inch space is left between the walls and backs of radiators. However, this can be varied to suit your convenience.

Figure 14
Use ratchet brace and ex-
pansion bit for boring floor
holes.



Connecting Radiator Valves

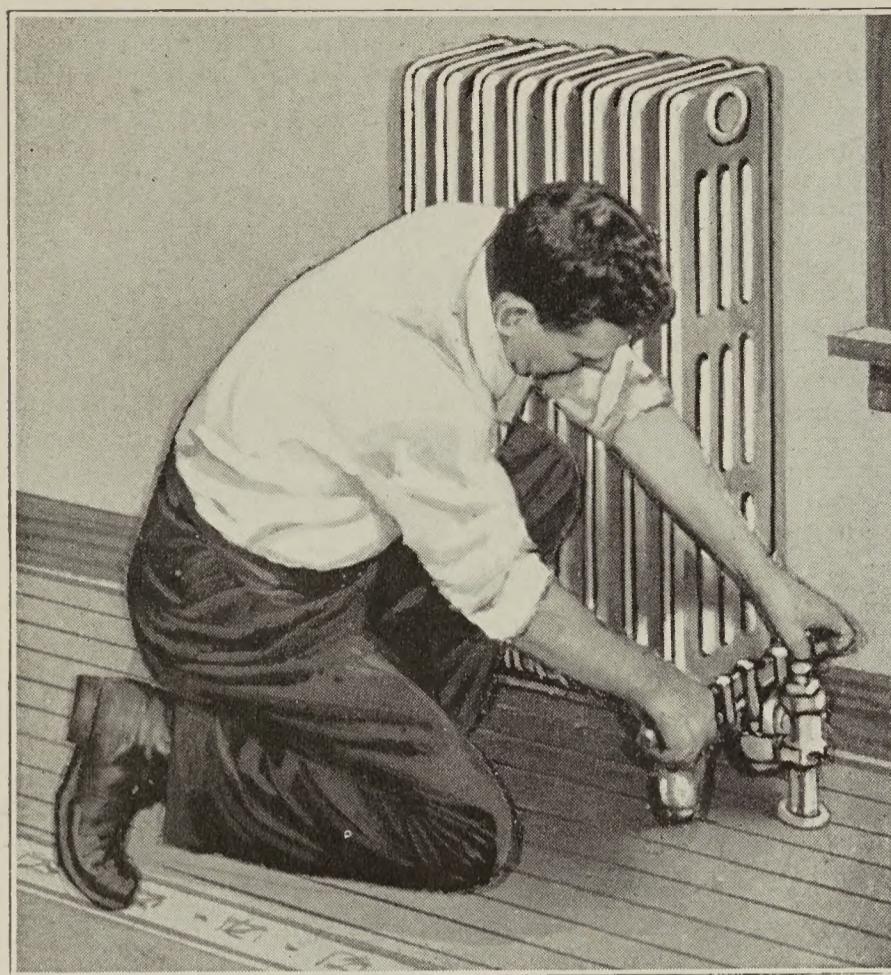


Figure 15

Tightening Radiator Valve. Radiator Valves and Union Elbows must seat squarely into socket or a tight joint cannot be secured.

The unions on all the radiator valves are of the ground ball joint type and they do not require gaskets. When tightening up these valve unions, however, it is very important to see that the ball joint parts come together squarely so that the ball seats squarely in the socket. Figure 15.

It requires very little tightening on the union nut to make these valve joints watertight if they are seating properly.

The best way to get this joint sighted properly is to unscrew the coupling nut and push it back toward the radiator. Then, by sighting between end of the valve and end of the spud, you gradually adjust the valve until these faces are exactly parallel with each other.

The valve and return elbow connection on the radiator should be in the correct vertical position; that is, it should not be lower or higher than the spud attached to the radiator. If the radiator valve is lower, it can be raised by putting a block of wood on the floor near the valve, and using the end of the pipe wrench as a lever under the edge of the valve for prying it upward.

If the valve is higher than the spud in the radiator, the pipe should be cut off to the required length; otherwise, there is danger of trapping the circulation. Sometimes these ball joint connections between the valve body and the spuds in the radiator require a very delicate adjustment in order to get the joints steam and water tight, and a little patience must be exercised to obtain this result.

Don't get the impression that when the valve leaks at this point, all you have to do is to tighten it on the coupling nut. Unless the end of the spud faces plumb toward the valve, you can sometimes tighten up the nut until you break it, and you will not get a tight joint.

Always use a monkey wrench on these nickel plated couplings of the radiator valve, and also on the valves themselves, as a pipe wrench will chew them up.

Installing AIR-FLO Radiators

When the Air-Flo radiator is to be installed set out in the room in a manner similar to standard type radiators, follow the same instructions given on page 5 for such radiators.

To get the best appearance of these radiators where so set out, we suggest the valves be placed inside the radiator legs. When this is to be done, set the radiator in place as described on page 5, attach the valves and take the measurements. Then move the radiator and bore the holes (see Boring Holes for Radiators, page 5). As it will generally be necessary to place a coupling directly in the floor at the feed valve, be sure to make provision for this when cutting the hole.

Concealed AIR-FLO Radiators

When Air-Flo radiators are set in the walls, recesses must be cut to accommodate them. If these recesses are to be cut in the wall of a brick house we recommend that the work be done by a bricklayer or one very proficient at this kind of work. Except that the cutting must be done in brick, the procedure is the same as that for setting the radiators in the walls of a frame house. In a frame house, the work is not at all difficult and can easily be done by almost anyone.

The Air-Flo, due to its low height, lends itself to the most efficient placing of radiators, that is, underneath windows. When possible, that is where the radiator should be placed.

Sketches of radiator in frame wall, Figure 18, show how the radiator is set in place. Take careful measurements from the radiator. We show a clearance of $\frac{1}{16}$ inch above and at the ends of the radiator. This has no significance other than to allow the radiator to slide into place. No insulation is needed on top or at ends. At the back of the radiator against the cold outside wall, insulation should be used. Sears' Walltite or any good insulation is suitable. This cannot be very thick, as it would take up too much space.

The enclosure should be closed at top, sides and bottom. Studding spaces if not closed off would act as a flue to rob heat from the room to be heated.

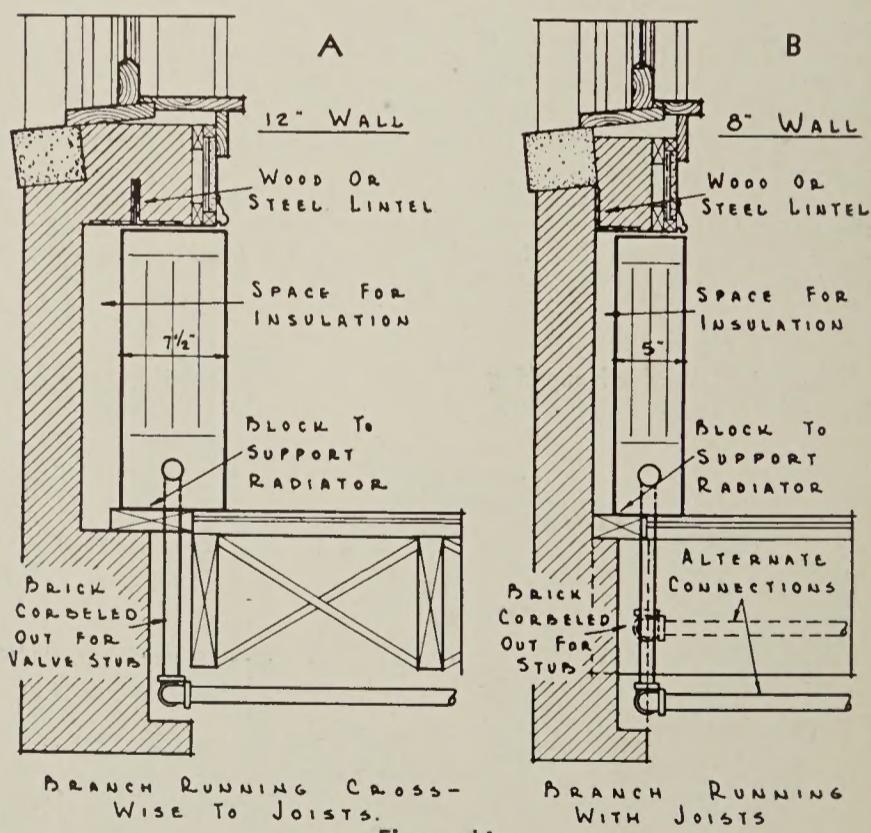


Figure 16

The illustration above shows how the Air-Flo radiator is set in a brick wall. Where this is done the brick must be cut away for the radiator recess and also part of the brick cut away below to allow for the valve stub. Notice that radiator does not set on brick but on a block set flush with the level of the floor. A larger space for insulation is allowed in the 12-inch wall than in the 8-inch. Figure (A) shows 12-inch wall with branch pipes running crosswise to joists, and figure (B) an 8-inch wall with branch pipes running parallel with joists.

Installing Air-Flo Radiators (Continued)

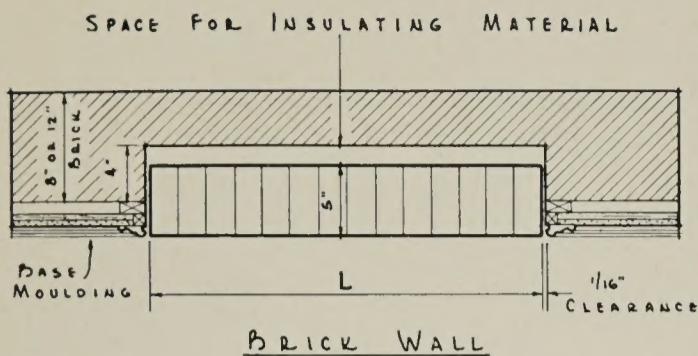


Figure 17

Plan of Air-Flo Radiator set in an 8-inch brick wall. The 1/16 in. clearance allowed so radiator will slip into recess easily. No insulation used at ends.

unless a stud comes close to the end of the radiator, one should be put in at this point. This will block any circulation of air inside of the wall and make a firm support for the trim around the enclosure.

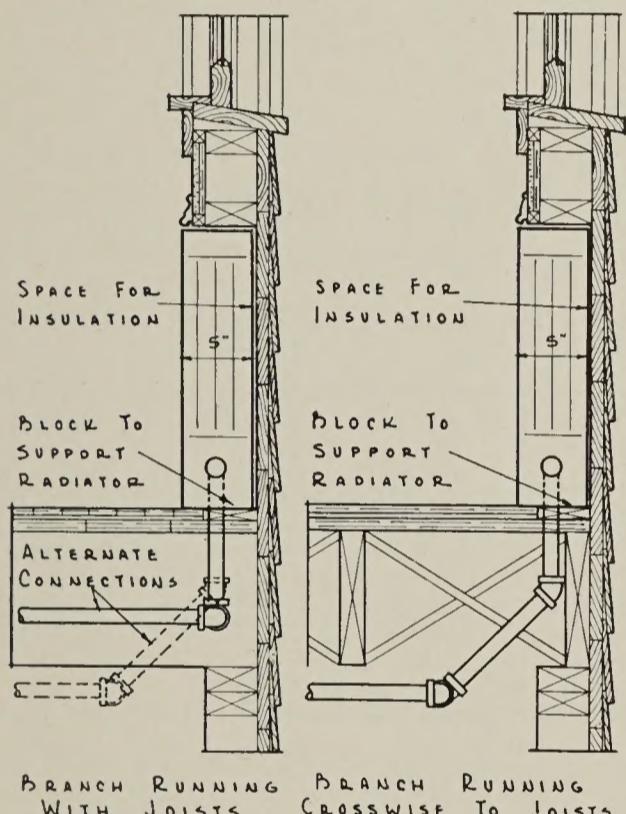
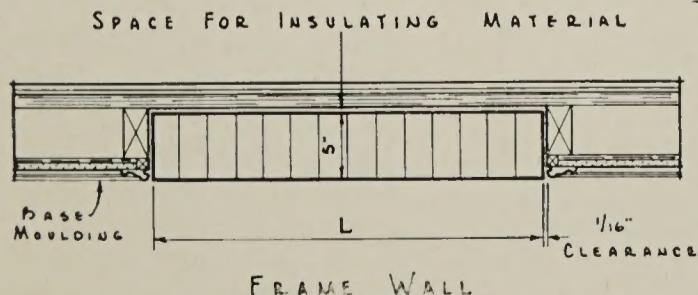


Figure 18

A cross section view of an Air-Flo radiator set in wall of a frame building. Notice studding space above radiator is closed off directly above and close to the radiator to prevent heat from going up inside walls. (Instead of a right angle elbow being used to connect valve pipe with valve stub—a short length of pipe with two 45° elbows are used when branch runs cross-wise to joists). As in the brick wall, the radiator is supported by a wooden block.

top trim being used around the enclosure. The groove or offset holds a small piece of ply board in place. In this sketch we show a "plaster stop." This can be omitted if the studdings are blocked solidly with 2x4's as we have already mentioned.

Figure 19

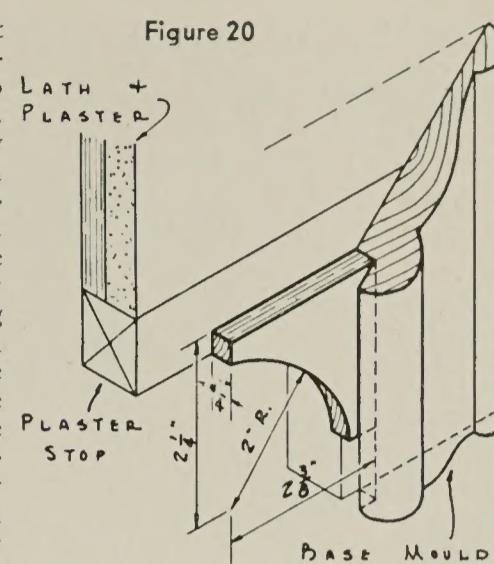


Plan view of Air-Flo radiator set in a frame wall. Ends are enclosed by boards to prevent heat from being wasted inside the wall.

Open spaces at the bottom would draw cold air from the basement instead of through the lower grille of the radiator. The studding cut out for the radiator can be used to block the spaces above. Use two 2x4's for the header. Because of installing the header, you will find it necessary to do a little replastering above the radiator.

When the recess is not beneath a window, provision must be made to support the wall above. This should be done by cutting the joists high enough to install a header above the radiator. Air-Flo radiation is made in lengths up to forty inches. With studding set on standard 16-inch centers it will never be necessary to cut more than two studs. These cut studs are then supported by the header extending to the full length studs on either side. Use two 2x4's for the header. Because of installing the header, you will find it necessary to do a little replastering above the radiator.

"Rounded Bracket Detail" shows proper way to carry base moulding around radiator frame, and also construction of the rounded bracket which follows contour of the radiator. The moulding is mitered to form a close fitting joint. This detail shows, too, the "plaster stop," a board used at top of recess to prevent falling plaster. This plaster stop is used both in frame and brick walls and as shown, supports the lath also.



ROUNDED BRACKET DETAIL

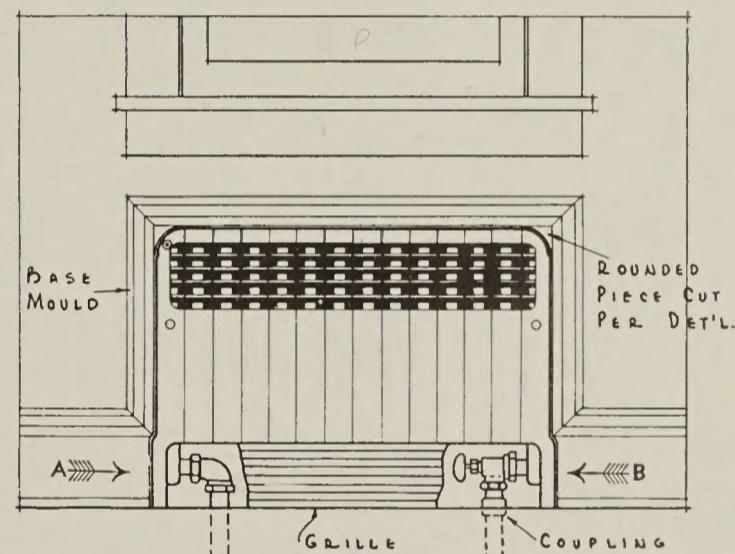
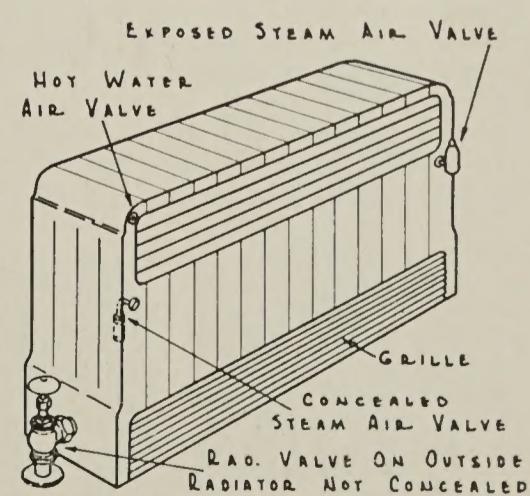


Figure 21

A straight-on view of a recessed Air-Flo radiator for hot water system in place. "B" shows the valve concealed. "A" shows the union ell connecting return pipe to radiator. On a steam installation the radiator opening at "A" is plugged as the return pipe is not used. Even if Air-Flo radiators are not recessed, valves may be concealed as shown. If preferred, they can of course be exposed in the conventional manner by screwing them into outside tappings as shown in the illustration below.

Figure 22

Three different types of air valves are shown on the radiator sketch. (Only one is needed.) With the standard exposed Steam Air Valve a bushing must first be turned into radiator valve opening; the special Air-Flo concealed air valves for both steam and hot water are also indicated.



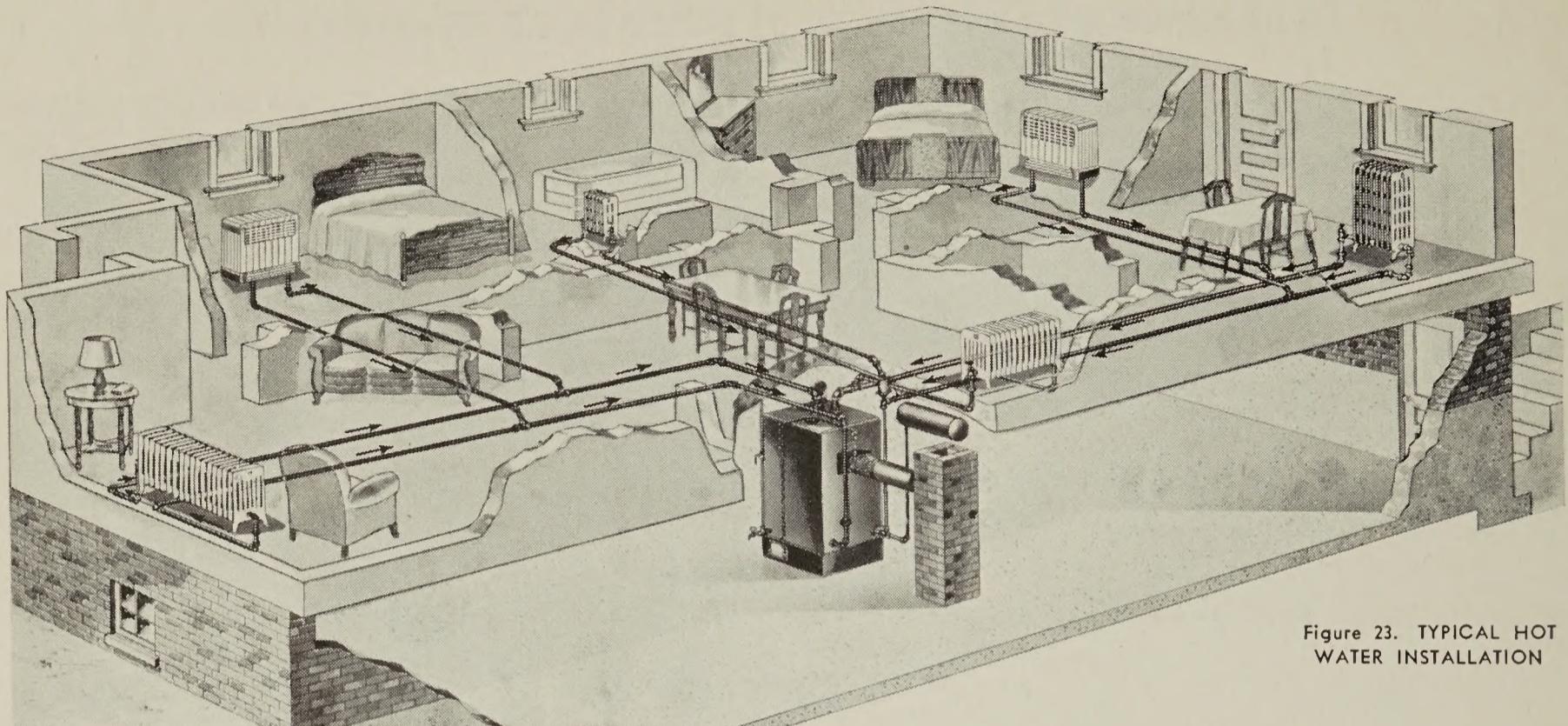


Figure 23. TYPICAL HOT WATER INSTALLATION

Principles of Hot Water Heating

(Page 7 to 11 for Hot Water Installations; for Steam Installations Turn to Page 12)

The cutaway illustration above (Figure 23) shows graphically the general style to be followed when installing a Hercules Hot Water Heating System. All main pipes and branches pitch downward from the radiators toward the boiler. The arrows in the above illustration point in the direction of the downward pitch. The lowest point of your piping system, therefore, is directly above the boiler. This pitch must be provided to allow the cold water to flow back to the boiler to be reheated. This illustration is also helpful in making clear the manner in which branch pipes are connected to the mains and the radiators to the branches. Notice the position of the closed expansion tank and the way in which it is connected to the system. A square boiler is shown in the illustration, although the same instructions apply for a round boiler as there is no difference whatever in the principles involved.

The diagram (Figure 24) below at right shows a hot water heating system in its simplest form. This simple form clearly illustrates the working principles involved. The boiler is located in the basement and pipe connections are made to the radiator on floor above as shown.

Hot Water Heating Is Easy to Understand

As water is heated, it expands. A cubic foot of water at 180 degrees will weigh less than a cubic foot at 60 degrees. When a fire is started, the water in the boiler becomes heated. Hot water being lighter in weight than cold water, it goes immediately to the top of the boiler and continues its course upward and out through the main pipes until it reaches the radiators, where it gives off its heat. When it cools off it gets heavy again, drops down to the bottom of the radiator, and goes out the opposite end of the radiator through the return pipe, continuing its course back down to the boiler, where it is reheated.

After the circulation is started it will continue as long as there is a fire in the boiler. Of course, the greater the difference in temperature between the hot and cold water, the faster the water will circulate.

When the open tank system is used, as here illustrated, no water is wasted. The only possible loss is the slight amount which evaporates from the expansion tank. When the tank-in-basement system is used, shown in Figure 23, a slight amount of water is released whenever the pressure in the system exceeds 30 pounds.

Many people have an idea that a hot water heating system is constantly using up water and that one must have city water or an elaborate water supply system to operate a hot water heating system, but this is not the case. After the system is once filled, you

will need to add only a few gallons of water in the course of a season.

The water in the return pipes is always colder than that in the supply pipes, as it gives off its heat to the rooms in passing through the radiators.

In a hot water plant the entire system (boiler, radiators, pipes, etc.) is full of water. Some means must be provided to relieve the pressure caused by the increased volume of the water as it expands after becoming heated. This is accomplished by using an expansion tank as in the simple system shown in Figure 24 or by using an automatic relief valve as described on Page 9. As the water expands it rises into the expansion tank in proportion to the rise in the temperature of the water. Should the water keep on expanding after filling the tank, it will be carried off by the overflow pipe provided for that purpose. When an open tank is used, the top vent is open to the atmosphere. The operation of the Hercules Relief Valve is explained on Page 9.

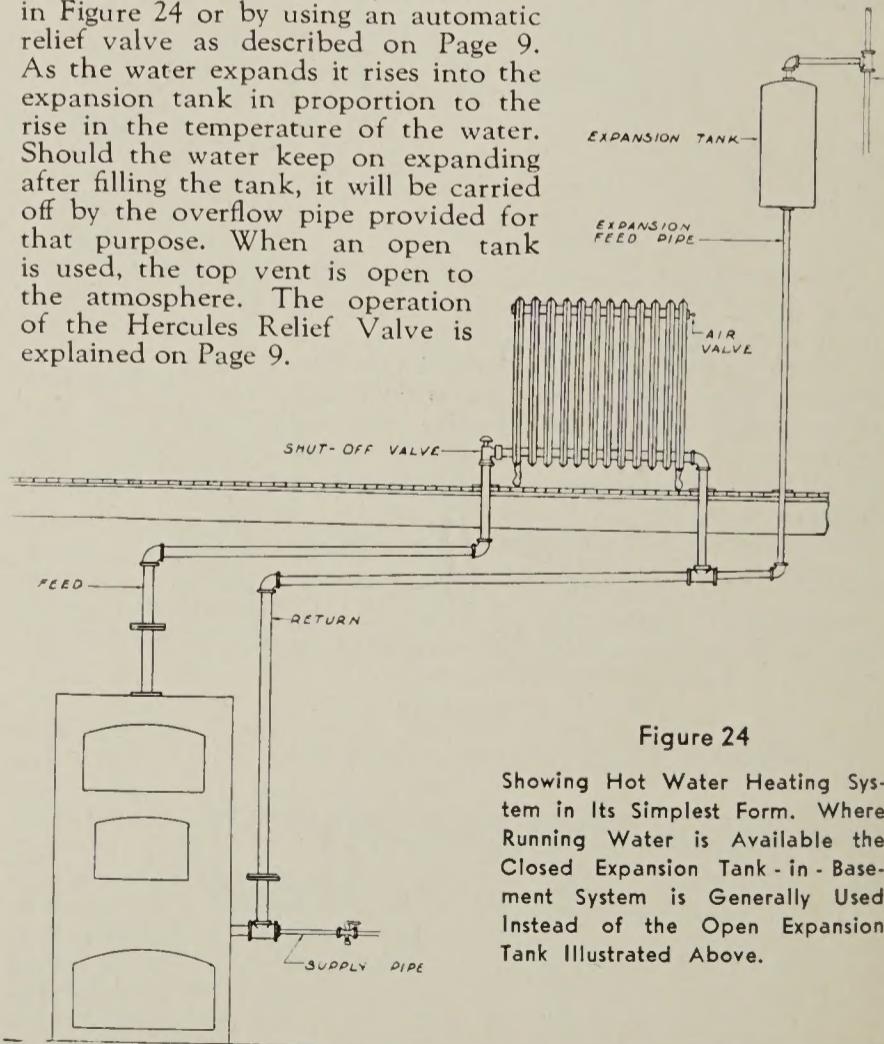


Figure 24

Showing Hot Water Heating System in Its Simplest Form. Where Running Water is Available the Closed Expansion Tank - in - Basement System is Generally Used Instead of the Open Expansion Tank Illustrated Above.

Installing Your Hot Water Heating System

When installing the piping mains and branches on a hot water heating system remember that every horizontal pipe on the entire system must pitch downward as it goes toward boiler. These pipes should have a pitch of about one inch in every ten feet. In the process of boiling or heating water there is always a certain amount of air and hydrogen gas liberated from the water.

All pipes on the system must be pitched so that this gas will find its way to the radiator where it can be liberated through the air valve, otherwise it would interfere with the circulation of the water.

When all pipes pitch upward toward the radiator as they go away from the boiler this air keeps traveling upward along the top sides of the pipes until it reaches the radiators, where it becomes trapped at the top. This air and hydrogen gas which accumulates at the top of the radiators will hinder the circulation of water through the radiators just as it would through the main pipes providing it were allowed to accumulate sufficiently.

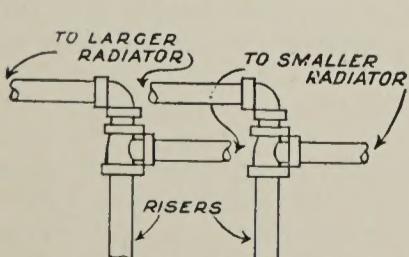
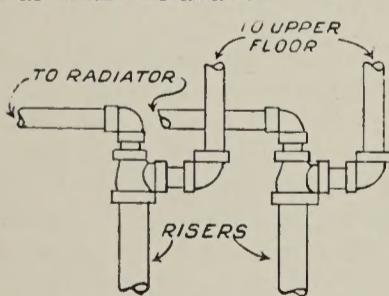
Where the riser leads to two radiators on the second floor, connect them to the riser as shown in Figure 27. The top feed and return pipes must lead to the larger radiator and the lower ones to the smaller, as indicated in the illustration. Hot water rises rapidly, and naturally the hottest water will be taken from the upper connection and therefore should run to the larger of the two radiators the risers supply. Where risers are to supply a radiator on the second floor and also one on the third or higher floor, connect the radiators as shown in Figure 26. In this way, the top feed and return pipe lead to the second floor radiator and the pipes taken from the side of the risers extend on up to the third floor.

When the piping is complete, attach the air valves to the radiator by screwing them tightly into the openings provided near top of radiator.

Tank-in-Basement System

With this system, the expansion tank is used in conjunction with an Automatic Pressure Relief Valve and the closed, airtight tank is placed in the basement.

The Hercules Relief Valve is a simple and positive-acting device which automatically relieves excessive pressure in the system when the water is heated to a high temperature. It opens at a pressure of about 30 pounds, protecting the system from damage from overheating. Illustration above, Figure 28, shows a typical Tank-in-Basement installation.



The closed expansion tank, containing more air than water, gives a cushion effect as pressure increases. This absorbs the expansion of the water and prevents the relief valve from opening at more frequent intervals. As the pressure is increased, the boiling point of water is raised. Closed systems permit higher water temperatures with correspondingly improved heating results.

The relief valve is used on one of the return pipes as shown and is placed in a vertical position. It has no diaphragm, springs, levers or other delicate, complicated parts. A weighted piston of monel metal, enclosed in a smooth bronze casting, is forced off its seat when the pressure in

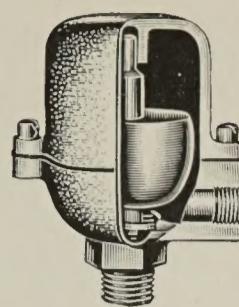


Figure 25

Cut-away view of Automatic Relief Valve. The piston and valve seat are made of special non-corrosive nickel mixture. No chance for this valve to jam, clog, stick or otherwise get out of order. The relief valve is used on one of the return pipes and is placed in a vertical position (Figure 28). *Be sure to install it as shown on our blue prints or instructions furnished.*

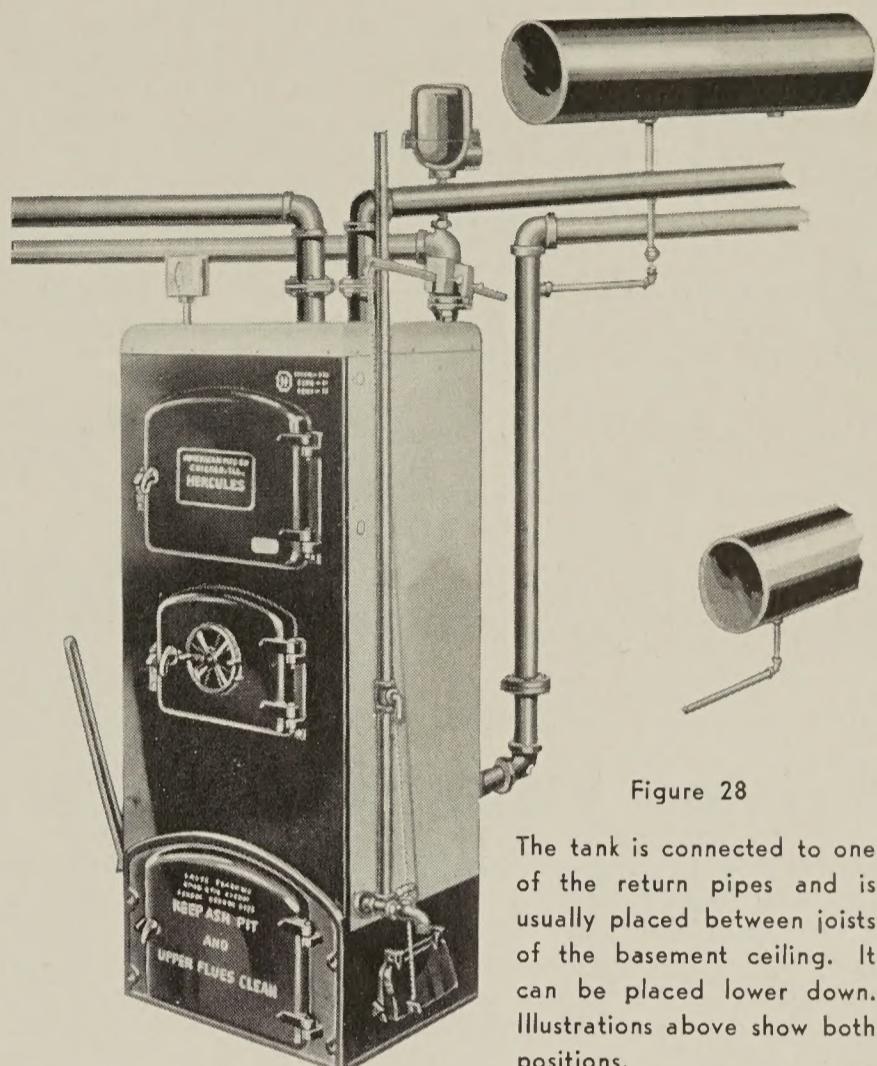


Figure 28

The tank is connected to one of the return pipes and is usually placed between joists of the basement ceiling. It can be placed lower down. Illustrations above show both positions.

the system exceeds that at which the valve is set. *Be sure to install this Relief Valve as shown on our blue prints or instructions furnished.*

The tank is connected to one of the return pipes, and is usually placed between joists of the basement ceiling. However, if there is not sufficient head room, it can be placed lower down. Illustration, Figure 28, shows both positions.

Open Expansion Tank System

When the open expansion tank system is used, the expansion tank must be located so that the bottom of the tank comes at least 12 inches above the highest radiator.

It may be placed in the corner of some closet where it will be out of sight (Figure 29) or in a corner of the bathroom, or it may be placed in the attic (Figure 30). However, if you locate it in the attic, try and place it up close to the chimney to which the heating boiler is connected and cover it all over with asbestos cement or wrap it with several old woolen blankets to keep it from freezing. Remember that there is no circulation of hot water to the expansion tank, as it is connected with a single pipe and it will freeze solid and endanger your entire heating system if not protected.

Do not extend the overflow pipe out through the roof as is sometimes done, as ice and frost often collect at the end or outlets of the pipe and causes it to become stopped up. This over-flow pipe must be kept free and open always to guard against developing excessive pressure in your heating system.

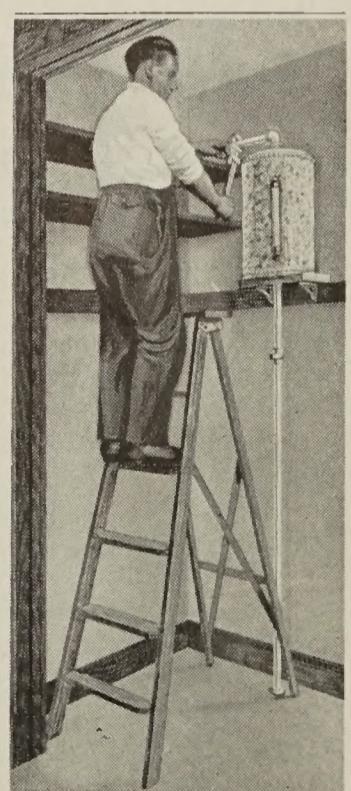


Figure 29

Installing Your Hot Water Heating System

The overflow pipe may be connected so as to discharge into a closet tank or into the laundry tubs in the basement. If you carry the overflow pipe down to the basement, however, it is advisable to use a $\frac{3}{4}$ -inch tee instead of an elbow where you turn to go down with the pipe and to extend a short piece of $\frac{3}{4}$ -inch pipe upward from the top opening of the tee for a vent so that the flow of water in overflow pipe will not siphon out the system. The blue print plan shows this connection in detail.

The pipe leading to the expansion tank, when the open expansion tank system is used, may be connected either to the return pipe at the boiler, or to the return pipe of any radiator, as shown in Figure 30.

Use $\frac{3}{4}$ -inch black pipe to connect the expansion tank with the heating system and place a $\frac{3}{4}$ -inch union in this pipe near the expansion tank to facilitate making the connection to tank.

The open expansion tank system is only furnished when running water is not available. If you have running water, we ordinarily furnish the tank-in-basement system, unless otherwise requested.



Figure 30

Testing Your Hot Water System After Installation

After the entire piping system has been completely connected it should be carefully tested for leaks before the pipe cover is applied. Fill the system with water, opening the air valves. This will insure every part of the plant being filled with water, except the expansion tank. This being a "closed" system, the expansion tank is airtight and the air in the tank does not escape, but is left there to provide a cushion, as explained on page 9.

While the system is being filled it is a good plan to keep a constant watch on the various pipes and connections to make sure that there are no serious leaks which might spoil the decorations in your living rooms if not detected in time. If radiator valve unions leak, unscrew them and see if mouth of valve is facing squarely toward radiator before pulling them up any tighter. The system must of course, first be drained. If the mouth of valve faces squarely toward the radiator, so that the ball joint seats squarely with full contact all around it will not leak.

Slow leaks sometimes will take up or rust tight in a few days.

If, after carefully testing the plant, you find that the water does not circulate freely through any one of the radiators, first try the valve on the radiator which is not heating to make sure that it is not shut off; second, open the small air valve at top of radiator and let out all air.

If radiator does not then start to warm up, the trouble is probably due to an air pocket in one of the pipes in the basement. Go down to the basement and make sure that all pipes leading to this particular radiator pitch downward toward the boiler.

If the instructions given on the preceding pages have been carefully followed, every radiator in your building will heat up evenly and there will be a rapid circulation of water throughout the entire system.

Care and Operation of Your Hot Water System

Combination Thermometer, Altitude and Pressure Gauge

This combined instrument performs a three-fold purpose. It is installed on the top of the boiler. The thermometer is an excellent guide for the person tending the fire. For medium cold weather it will be found that a temperature from 120 to 150 degrees will be sufficient, but during very severe weather it may be necessary to increase the temperature to 180 or even to 200 degrees. This can best be ascertained by experience, as the temperature required will vary in different heating plants. The proper degree of heat to carry will depend entirely on how well the house is built; and whether it has storm windows and doors, and the outdoor temperature.

The altitude and pressure gauge part of the instrument shows the height of the water in feet and the water pressure in pounds.

With an open tank system, after you have filled the system so all radiators are filled with water, make a note of the reading on the gauge. This is the pressure to maintain in the system. When the pressure falls below that reading more water should be put into the system to bring the pressure back to normal, as the more air there is in the system the less efficient the plant will be.

Operating the "Tank-in-Basement" System

Close all air valves on radiators and let water into system through the supply valve. Open air valves on the first floor radiators until water shows, then close. Repeat operation on second and third floors. As soon as water appears at the air valve on the highest radiators, shut off the water supply valve. With the supply shut off, note the exact point which the hand stands on the dial of the gauge. The pressure should not drop below this point while the plant is in operation.

Open the supply valve and run water into the system until the relief valve operates. After making sure that the relief valve is working, shut off the supply and let enough water out of the system to bring the gauge pressure back to the point you had noted.

Small amounts of water will be released through relief valve from time to time. Also air will accumulate in the radiators, which must be released through the air valves. This reduces the pressure on the system. Whenever you note the gauge reading lower than the point first noted, add sufficient water to bring it up to that point.

Hercules Heating Systems

Care and Operation of Your Hot Water System

Every two weeks or so, open all the radiator air valves to allow all gas and air to escape. Keep the valves open until water starts to spurt out and then close them tightly. It may then be necessary to add more water to the system. Note the hand on the boiler gauge.

Adjusting the Drafts

All Hercules heating boilers are equipped with our diaphragm damper regulator, see Figure 28. By moving the weights along the rod the regulator can be adjusted to maintain the boiler water at a certain temperature. After operating the plant for a short time you can determine what water temperature is needed to keep your house comfortable under various weather conditions. One end of the regulator arm is connected by chain to the ashpit draft door and the other to the small lift door (check draft) at the smokehood. In addition to this lift door there is a damper set inside the smokehood.

Set the inside damper to give you a uniform heat; that is, a steady, even draft; and after it has once been set at the proper angle do not change it, except during very foggy weather when the draft is poor.

In the firing door there is a small damper which is known as the soft coal air inlet. This damper should be opened wide when burning soft coal or wood to allow the air to pass into the fire box, which is necessary to consume the gases given off by these fuels. Opening this damper will act as a slight check on the fire when hard coal is burned.

It is best not to shake the grates too frequently in mild weather, as you will thus be able to keep a low fire without the necessity of having the check damper wide open. Keep the fire box full of coal at all times, as a slow fire with the fire pot full is more economical than a small body of coal burning with an intense heat. In severe weather shake the grates thoroughly, either once or twice a day, and if the fire is low put in only a small quantity of coal until it gets a good start, after which the firebox may be filled.

A thick, deep body of coal, burning slowly, is the most economical and requires the least attention.

If the System Boils Over

Even though your hot water heating plant is given careful attention, you may forget at some time to close the dampers after opening them, and the temperature of the water will be raised to the boiling point. No damage can be done by this boiling, unless it continues for a considerable length of time, but sometimes if the fire is very hot this boiling becomes violent, causing a great deal of pounding and rattling and loud noises in the pipes and radiators in every part of the system. The noise is caused by the steam rising through the water, and as the only means of escape is through the relief valve or

the expansion tank, the steam must pass through considerable water before reaching the atmosphere, and it will therefore carry a quantity of the water with it.

When your hot water system starts boiling, the draft damper on the boiler should be closed and the check damper opened. If this does not check the fire sufficiently to lower the temperature of the water, open the flue door and firing door and throw a few shovelfuls of ashes over fire. After the temperature has been brought down to 180 or 190 degrees, refill the plant with water to the proper height and open all the air valves so the air in the top of the radiators may escape. It is very important that every part of the hot water plant be filled with water at all times, as a small amount of air in a radiator or pipe will keep the water from circulating. Should a radiator suddenly stop heating, you can rest assured that air has collected in the top. By opening the little valve the air escapes and the radiator will again heat properly.

A Few Important Things to Remember

It is well to remember that good coal, proper attention and care fully following instructions are necessary to get good results. Do not expect a boiler or heating apparatus to run itself without the necessary care and attention. No great amount of skill is required, but good judgment must be used in firing the boiler and adjusting the dampers to suit different kinds of weather. When the wind is blowing hard, the fire will burn fast and the check damper should be opened and the draft damper closed. If the grates burn out or warp, do not assume that the iron of which they are made is of poor quality, as poor iron does not melt or burn out any quicker than good iron. The only cause for grates melting or burning out is an accumulation of ashes in the ashpit, which keeps the air from circulating freely around the grates. They are sometimes warped by creating a very intense coal fire in the boiler without any ashes on the grates and then shutting the draft dampers tight. This prevents the cold air from circulating through the ashpit and the grates warp from the intense heat radiation. Inspect the boiler frequently and see that the flues are kept clean and all working parts in good order.

Never allow your heating plant to remain full of water during cold weather without a fire in the boiler. If the water freezes in any part of the system, it will crack or burst that part of the plant and may be the cause of cracking the boiler sections. When it is necessary to leave the plant in cold weather without a fire, drain all the water out of it. This is done by first opening the drain cock at the side of the boiler and then opening the little air valve on each radiator in the house. Be sure to leave all of these radiator air valves wide open until system has completely drained, otherwise water will not run out of the radiator or the piping system.

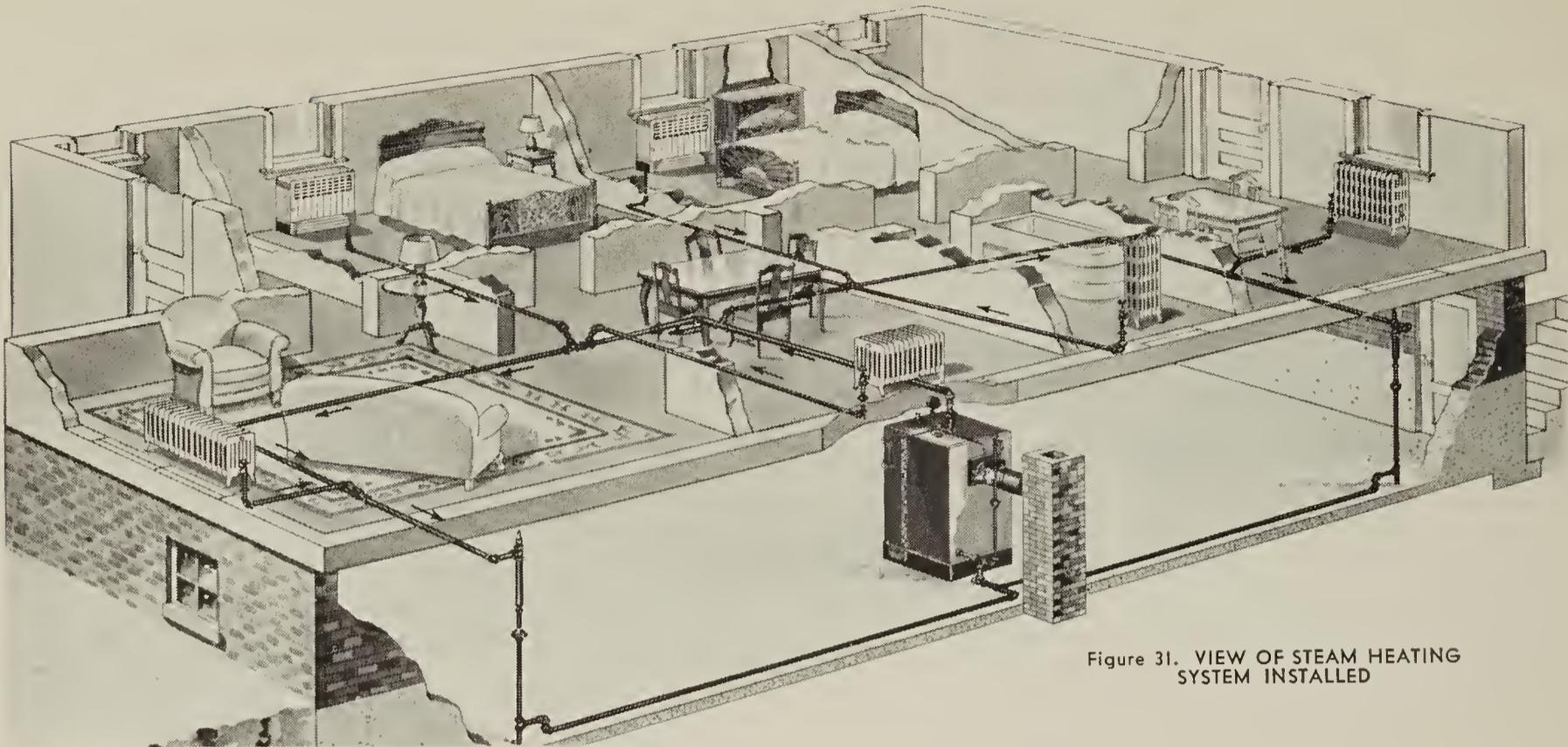


Figure 31. VIEW OF STEAM HEATING SYSTEM INSTALLED

Principles of Steam Heating

The illustration above, Figure 31, is a cut-away view showing a typical steam heating system installed.

The basic principle of steam heating is that steam will rise and water flow down hill. The steam created by boiling water in the boiler rises into the pipes and is carried to the radiators throughout the house where it gives off its heat. Then it slowly condenses into water which flows back to the boiler through the same pipe and is again converted into steam. This is a continuous process. It is to allow this water to flow back to the boiler that *all branch pipes in a steam heating system are pitched down from the radiators*.

Very little steam ever escapes from the system. The automatic air valves on the radiators and at the end of each main prevent it.

These valves allow any air in the system to be pushed out by the steam. As soon, however, as the steam strikes the valves, the valves close tight, locking the steam in the system.

An important feature of the Hercules piping system which results in smooth operation, perfect circulation in the radiators and freedom from noise and hammering, is the fact that in the large main the water travels in the same direction as the steam.

The large main is carried ample size around the basement past the connection for the last radiator. A smaller sized water return pipe, which then carries the water condensation back to the boiler, is connected to the large main pipe with a reducer, insuring complete and silent drainage.

Installing Your Steam Heating System

Connecting Mains in Basement

On our Hercules Steam Heating System, we do not make any reduction in the size of the main pipe until the last radiator connection is taken off. The main is run full size all around the entire circuit so that this pipe is always free from water pockets, and the steam and water circulate freely and noiselessly, making a perfect, smooth working system.

Attention is called to the fact that both the steam and the water circulate in the same direction in the main pipe, so that there is no interference whatever.

If you find it necessary to make any slight change in the arrangement of connecting any particular radiator from the method indicated on our plan, due to some special condition, if you will just keep in mind the fundamental principle that the radiator must be connected in such a way that any water of condensation which forms will surely find its way back to the main pipe, and if you will see that the connecting pipes leading to the radiator are properly pitched so that this is accomplished, then the particular manner in which the connection is made makes very little difference so long as it is made so that the steam will flow freely to the radiator, and the water of condensation will flow freely without interference back to the main pipe.

In order to get a good, free flow of steam and water, the fewer elbows you use in making any particular connection the better it is for the system. The hammering noises which are often heard in steam heating systems, especially at time of starting, are an indication that there is interference between the steam and the water in circulating to that particular radiator where the noise occurs. The remedy is to remove this interference by having the pipes pitched properly so that complete drainage is obtained.

A drain cock is provided so that the system may be drained in case the building is allowed to stand idle during cold weather, and it should also be opened at frequent intervals to drain off any sediment which may form at the bottom of the boiler.

In a steam heating plant the highest point in the main is directly over the boiler. Sometimes conditions occur where this does not hold true, but this is exceptional and in these cases it will be clearly indicated on your plans. Otherwise the high point is directly over the boiler at the top of the supply riser. From this point the pipe should pitch downward along the entire length of the mains.

Pipe Must Be Properly Pitched

It is well to get a good high start, for if you start too low, by the time you get to the return connection, the main will hang too far from the ceiling and will not allow enough headroom in your basement. Do not, under any circumstances, sacrifice pitch to the pipe in order to keep the pipes up high and close to the ceiling. This circulating main should pitch down at least 1 inch to every 10 feet, and if you can give it a greater pitch than this, we would certainly advise you to do so. Air vent at the end of return line must be connected at least 14 inches above water line of the boiler.

The branch pipes leading from mains to radiators should be given as much pitch downward toward the main as possible.

It is well to always bear in mind that there must be continual downward pitch along all the piping from the radiator to the return connection at the boiler. This permits the condensation to flow back to the boiler. Any low point in the piping will fill with water. This will prevent the radiators from heating properly, and will cause a "water hammer" in the system.

Hercules Heating Systems

Installing Your Steam Heating System

An eccentric reducer is generally used in the main where the pipe size is reduced. See Figures 32 and 33. Be sure to install this fitting in the proper manner. The exact position is shown on your blue print.



Figure 32
The Wrong Way

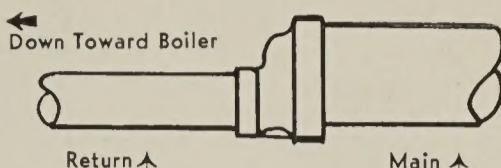


Figure 33
The Right Way

In connecting the eccentric reducer be sure that you have it turned in the right position, as clearly illustrated in Figure 33.

Use Reducing Tees in Main Pipe

At each place where a radiator connection is to be taken off from the main, a tee is placed of the size indicated on your blue print. In most cases, reducing tees will be used, having the side opening smaller than the size of the main pipe.

Connecting Steam Radiators

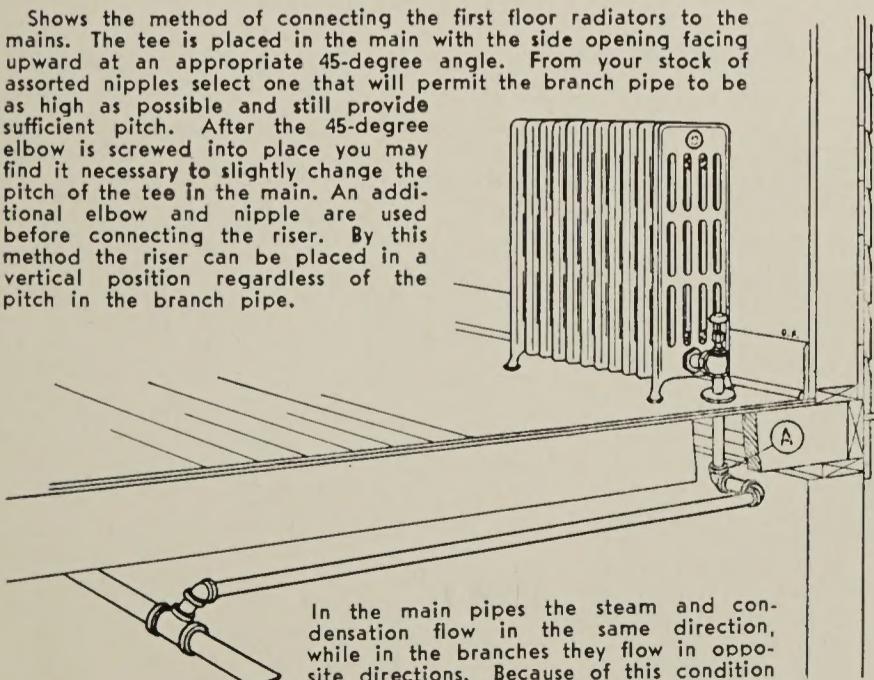
On this and the next page we show diagrams illustrating standard methods of connecting steam radiators to the mains in the basement. By referring to these diagrams in connection with the figure numbers shown on your blue print you can readily understand just how each branch connection is designated. Again we want to impress the importance of providing proper pitch. Be sure to pitch the branches down at least 1 inch in 10 feet toward the mains.

Automatic Air Valves

An automatic air valve should be placed on each radiator and at the return end of the main pipe. This valve is so devised that it permits the escape of air from the system, but as soon as the air is driven out by the steam, and the steam hits the valve, an expansive member closes the valve tight and locks in the steam. On the radiators, place the air valve on the last section, midway between top and bottom, where a special tapping will be found for attaching the air valve. Never place the air valve at the top of the radiator.

Figure 34

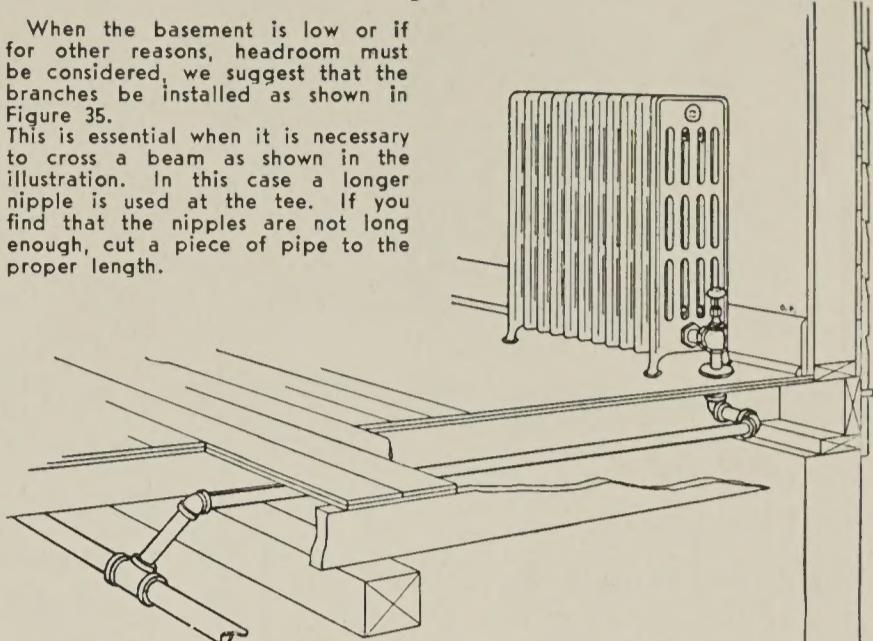
Shows the method of connecting the first floor radiators to the mains. The tee is placed in the main with the side opening facing upward at an appropriate 45-degree angle. From your stock of assorted nipples select one that will permit the branch pipe to be as high as possible and still provide sufficient pitch. After the 45-degree elbow is screwed into place you may find it necessary to slightly change the pitch of the tee in the main. An additional elbow and nipple are used before connecting the riser. By this method the riser can be placed in a vertical position regardless of the pitch in the branch pipe.



In the main pipes the steam and condensation flow in the same direction, while in the branches they flow in opposite directions. Because of this condition we increase the branch pipes one size larger than the size of the valve specified at the radiator. This permits the condensation to flow back to the mains without obstructing the steam. A reducing elbow "A" is placed at the bottom of the riser.

Figure 35

When the basement is low or if for other reasons, headroom must be considered, we suggest that the branches be installed as shown in Figure 35. This is essential when it is necessary to cross a beam as shown in the illustration. In this case a longer nipple is used at the tee. If you find that the nipples are not long enough, cut a piece of pipe to the proper length.



Attaching the Steam Trimmings

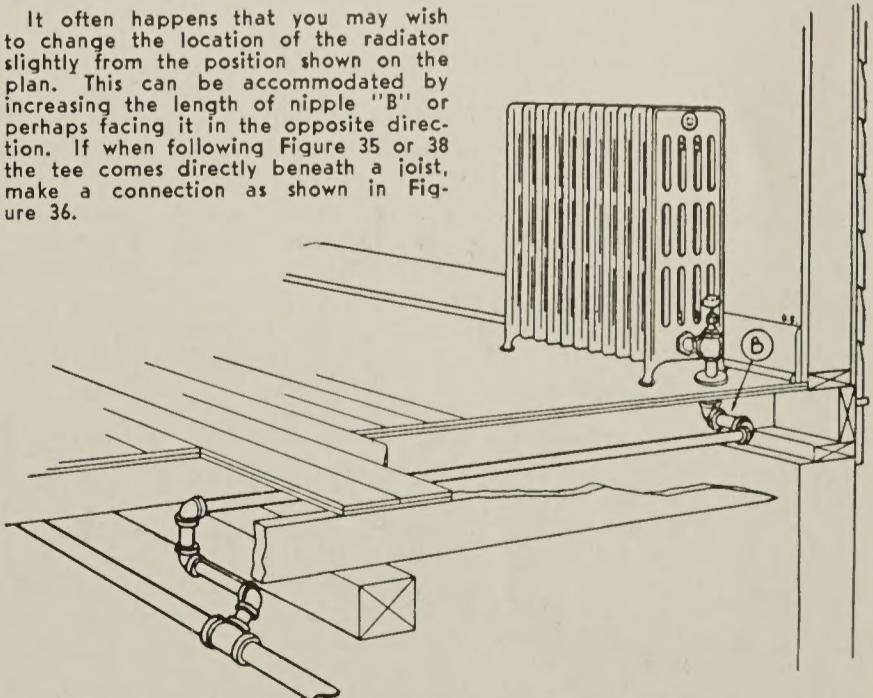
After your boiler and radiators have all been connected up, the last thing to do before testing the system is to put on the steam trimmings. The steam trimmings for your boiler comprise the following:

- 1 water gauge with brass gauge cocks and guard rods.
- 1 automatic diaphragm damper regulator.
- 2 brass tri-cocks.
- 1 brass safety valve.
- 1 pressure gauge.

The water gauge is connected to the side of the boiler as shown in Figure 31. The purpose of this is to indicate water level in the boiler. In fitting up the water gauge to the boiler, be careful not to break the glass. To insert the glass have the upper gauge cock facing downward and then turn the lower gauge cock so that it faces out toward the front of the boiler at an angle. Next unscrew the coupling nuts from each of the gauge cocks and slip them over the glass tube. Next slip the rubber washers over the tube so that it will stand about 2 inches from each end. Now insert the upper end of the glass tube in the upper gauge cock. Raise it up as high as you can and, if the glass is the proper length, you can now insert the lower end into the mouth of the lower gauge cock, allowing the glass to fall down into place as you turn the gauge cock to face upward.

Figure 36

It often happens that you may wish to change the location of the radiator slightly from the position shown on the plan. This can be accommodated by increasing the length of nipple "B" or perhaps facing it in the opposite direction. If when following Figure 35 or 38 the tee comes directly beneath a joist, make a connection as shown in Figure 36.



Installing Your Steam Heating System

Steam Trimmings (Continued)

Drop the tube down so that it will project an equal distance into each of the gauge cocks. You can then slide the coupling nuts and rubber washers into position and screw them up tightly, making a good tight joint between the glass tube and each of the gauge cocks. Next insert the guard rods.

The damper regulator is attached to the boiler as shown in Figure 39. The purpose of this regulator is to close and open the dampers as the steam pressure rises and falls in the boiler.

By sliding the weight backward or forward on the beam, proper adjustment is secured. The diaphragm is attached to the boiler with a long pipe nipple. A chain is attached from each end of the beam, one of which connects to the draft door at the side of the boiler and the other to the check door on the smoke hood.

The regulator must be turned in such a way that when the pressure in the boiler rises, the check door will open and the draft door will close, and vice versa.

To Clean a Water Gauge Glass on a Steam Boiler

The tri-cocks, safety valve, and pressure gauge are next screwed into the tapped openings provided for them, on the boiler. You are now ready to test the system.

Figure 37

Figure 37 shows the branch connection to a second floor radiator. The same method is followed as described in Figure 34. A union is added to facilitate the installation of the long riser. You will also note that a coupling is shown in the riser. It is often more convenient to install the riser in two pieces.

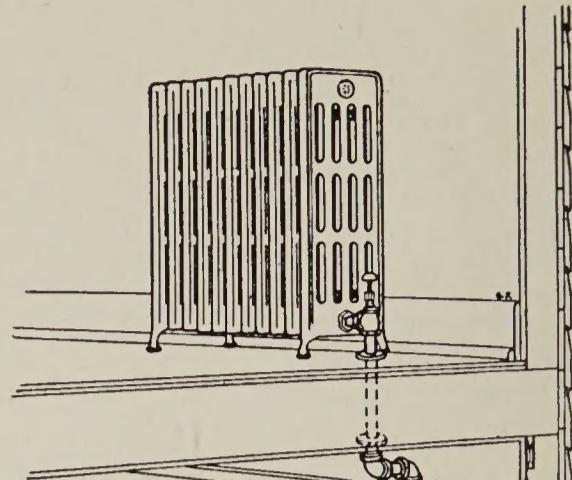
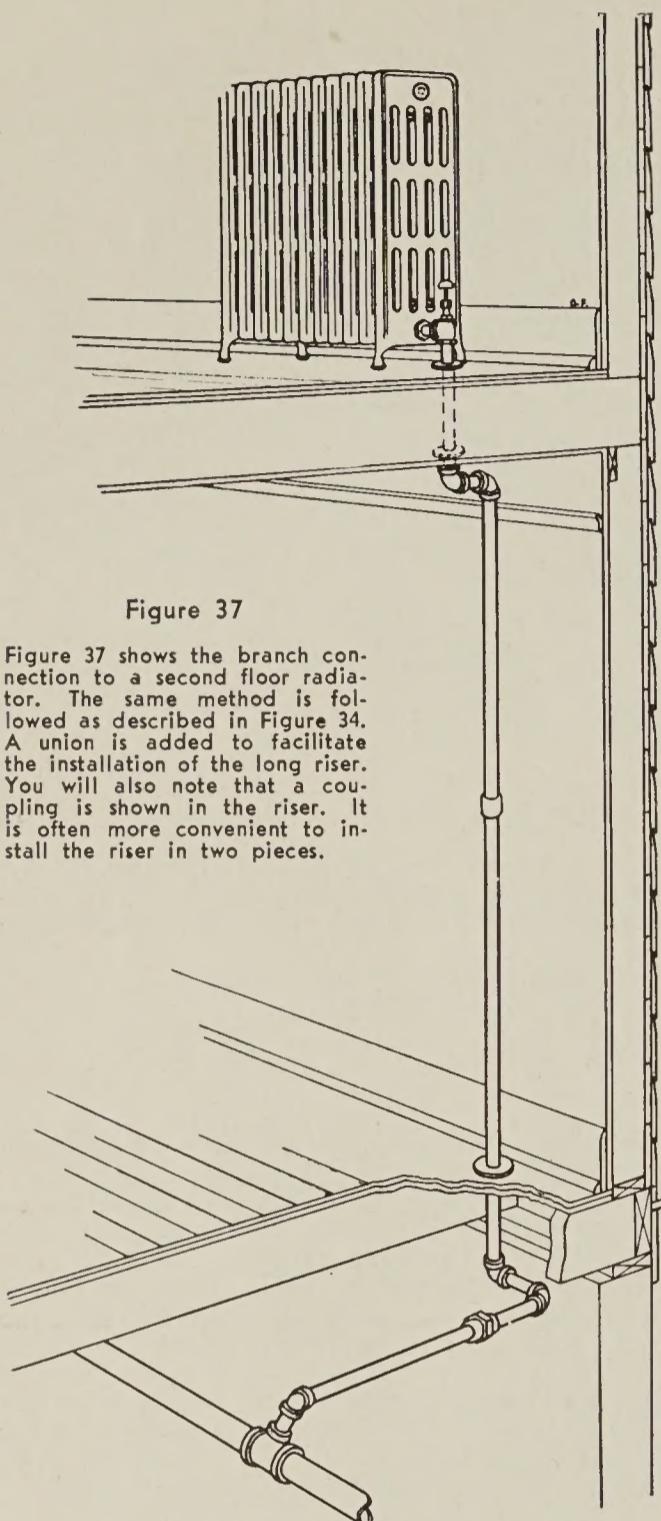
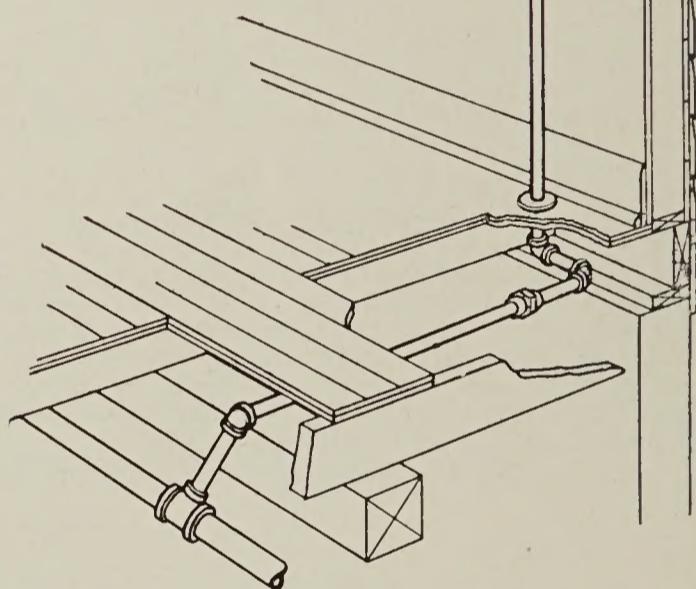


Figure 38

Figure 38 shows a second floor radiator connection where we find it best to run the branch over the beams as explained in Figure 35.



1. Draw a cupful of hot water from the boiler, into which pour at least a tablespoon of raw muriatic or other acid.

2. Close both water gauge valves.

3. Open top water gauge valve and also pet cock at bottom, and blow water out of glass. This immediately closes the top valve and submerges the end of the pet cock in cup of acid solution. A vacuum is at once created in the gauge glass, which causes the solution in the cup to rush in.

4. Keep the pet cock immersed and operate the top valve, slightly opening and closing, alternately, expelling and drawing in the solution until all grease, oil or other matter adhering to the inside of the glass is cut out. Then close the pet cock and open both water gauge valves.

It is necessary to have 1 pound pressure of steam or more on the boiler before commencing this operation, which need not occupy more than 10 minutes. The result is a clean glass without the risk of breakage and probable renewal of gaskets, which is frequently the case when removing the glass for cleaning.

Operating Your Steam Heating System

After the entire system has been installed and the plant is put in operation, drain the boiler and again fill it with fresh water at least three or four times during the first month it is in use. This is to clean out all dirt, oil and grease which may accumulate in the radiators, pipe and boiler. To clean out the system thoroughly, build a fire and as soon as the water reaches the boiling point and the steam has traveled through the pipes and radiators, dump the fire and remove it from the ashpit; then, after the water has cooled slightly, drain the boiler. The water will be very dirty and contain a great deal of grease. Do not refill the boiler with cold water as long as the sections are hot, as this might crack them.

If at any time during cold weather the plant is to be left without a fire in the boiler, be sure

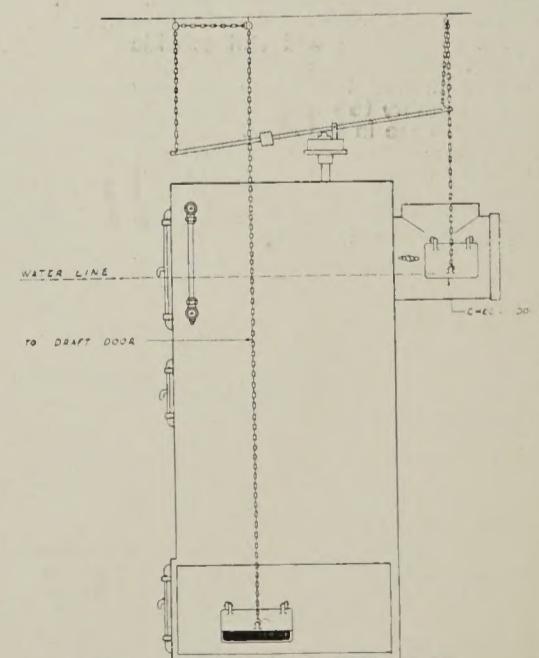


Figure 39

Installing Your Steam Heating System

to drain out all the water at the draw off cock at the side of the boiler. If this is not done, the water may freeze and burst the boiler sections.

The steam pressure required for properly heating your building will vary from $\frac{1}{2}$ to 6 pounds, according to the outdoor temperature, the manner in which the house is built, and to what temperature the rooms are to be heated. During mild weather, it is well to shut off a few of the radiators in the house and depend on one in the hall and one in the sitting room to heat the building. By operating the plant in this manner, you will be able to carry a pressure on the boiler, and still not overheat the house.

It is impossible to advise just how wide open to have the check and draft dampers in order to have the plant work properly, as conditions surrounding the installing of the plant will greatly affect the operating of the boiler.

The water in the boiler should be kept a little above the middle of the water gauge. Open the try cocks two or three times a week to see that they are free from any sediment or other matter that will tend to clog them. By opening the little drain cock at the bottom of the gauge, you can tell whether the gauge cocks are open, as the water will move up and down in the glass when opening and closing this little cock.

It is very important that there be sufficient water in the boiler when opening the draft damper in the morning. At times, while the plant is in operation, the water may rise and fall in the glass, but this need cause you no uneasiness, as it is probably due to an unequal pressure in the system. The water should become steady, however, as soon as the plant has been in use long enough to heat all the radiators in the house. If, at any time, the water disappears from the glass, and you are in doubt as to whether there is sufficient amount of water in the boiler, do not fill it with a cold supply, or the sections will crack, but open the firing door and let the fire cool down.

There is a small damper in the fire door which should be opened when burning soft coal or wood, for it is necessary that air comes in contact with the burning gases in order to properly consume them. When using hard coal, however opening this damper will act as a slight check.

During mild weather, it is best not to shake the grates more than once a day. Shake them gently, and keep the fire box full of coal; a large body of coal burning slowly is far more economical than a

small fire which burns out rapidly. In severe weather, shake the fire, thoroughly twice a day, but should the fire ever burn low, put on only a small amount of coal until it gets a good start, and then the fire box can be filled.

It is very important that the asphalt be kept clear of ashes at all times. Should the ashes accumulate, they will keep the air from coming in contact with the grates. This causes the grates to melt and burn out.

Keep all heating surfaces of the boiler free from soot and other foreign matter, as a coating of soot on these parts will greatly diminish the efficiency of the boiler and cause a waste of fuel.

When turning on a radiator, turn the valve wide open, otherwise the water will accumulate in the radiator and cause knocking or pounding noises which are very disagreeable; and for the same reason when shutting off a radiator valve, turn it down good and tight. Should the pressure on the plant rise at any time to the point at which the safety valve is set and steam escapes from this valve, do not feel alarmed, but open the firing door slightly and close draft damper. If necessary, you can take a couple of shovelsful of ashes from the ashpit and throw them on the fire to bank it, and the pressure will go down at once. Try the safety valve occasionally to see that it works freely and does not become clogged or stuck to the seat. This is done by pulling down on the lever at the side of the valve.

Never allow the water line in your steam boiler to drop below the point midway between the gauge cocks on the water glass. Never open the feed cock allowing water to enter the boiler while fire is still burning, unless you are absolutely sure that water shows in the glass.

If the water drops so low that it is no longer visible in the glass close the ashpit door tight, open the damper in the smoke pipe wide, open the firing door and the flue door wide and completely cover the fire with ashes three or four inches deep so as to smother the fire. Allow the boiler to cool off gradually, and after the fire has gone out and the boiler has completely cooled off, take out the dead fire, refill the boiler to the proper height for water line and start a new fire.

By carefully following the foregoing instructions, the plant will heat your building with the least possible fuel and you will have the system under perfect control at all times.

Figure 40

Painting Radiators

Do not paint the radiators until after the system has been tested and is cooled. Pieces of wrapping paper or newspaper can be placed under and in back of the radiator to prevent spotting walls or floor while painting radiators.

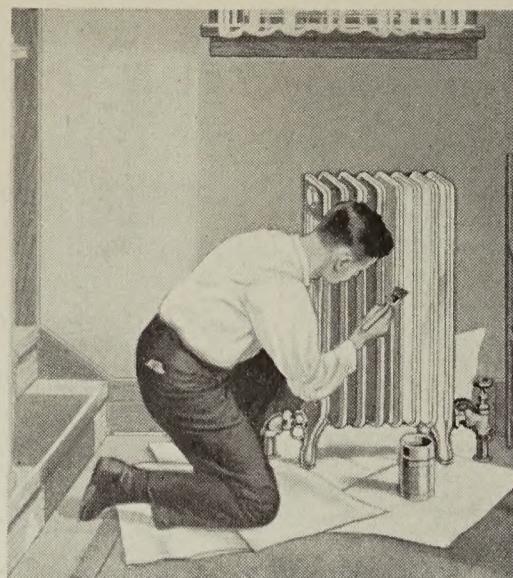
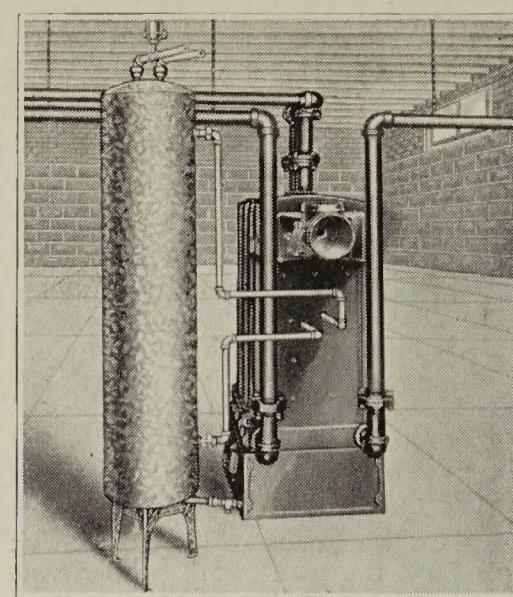


Figure 41

Connecting Range Boiler

The illustration directly left shows the proper method of connecting a range boiler to hot water coil in fire box of boiler.



Good Draft Necessary for Best Results



Figure 42

Faulty chimneys are responsible for more heating systems not giving satisfactory service than any other cause.

To burn any kind of fuel in your heating system economically, you must have a chimney with a good strong draft. First of all the chimney must be large enough. You cannot get satisfactory results if the chimney is too small.

To get the best results the chimney to which your heating plant is connected should have no other connections made to it, such as fireplaces, stoves, etc.

The top of the chimney should extend above all surrounding objects, such as other buildings, tall trees, etc., otherwise descending air currents will cause down draft (see Figure 42).

Be careful not to put the smoke pipe too far into the chimney, for if the end comes through into the inside of the flue, it will reduce the draft (see Figure 43).

The following table, although not absolutely accurate for all installations, will serve as a guide in ascertaining the size chimney to use:

Total Square Feet of Hot Water Radiation in Radiators	Total Square Feet of Steam Radiation in Radiators	Size of Flue
300 to 600	180 to 360	8x 8 in., 20 ft. high
600 to 1,000	360 to 625	8x12 in., 30 ft. high
1,000 to 1,500	625 to 940	12x12 in., 40 ft. high
1,500 to 2,000	940 to 1,250	14x14 in., 45 ft. high
2,000 to 3,000	1,250 to 1,875	16x16 in., 50 ft. high
3,000 to 4,000	1,875 to 2,500	18x18 in., 50 ft. high
4,000 to 6,000	2,500 to 3,750	20x20 in., 60 ft. high

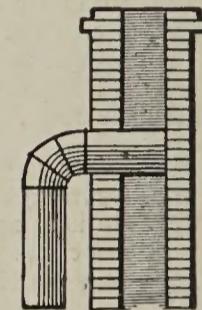


Figure 43

Remember, there is not a boiler made which has a draft unless it is supplied by an electric blower or other mechanical means. It is the chimney that furnishes the draft, not the boiler.

Sometimes a new or so called "green chimney" will smoke when all conditions seem to be ideal. This is generally caused by dampness and, as a rule, the chimney starts to draw well as soon as it gets warmed up and thoroughly dried out.

Chimneys should be examined once a year and always kept free from soot. If the chimney appears to have a collection of soot inside, this can be knocked down by getting up on the roof and letting a brick down inside attached to a clothesline. By moving this clothesline up and down, striking the brick against the sides of the chimney, the soot will be knocked loose and it will fall to the bottom, where it can be removed through the flue opening in the basement.

Keep the outside of the chimney well plastered, so as to be perfectly airtight. Air leakage through the cracks will greatly handicap the drawing power of the chimney. Arches of brick are sometimes built over the tops of chimneys. This is not recommended. Leave the top open.

Keep the boiler flues thoroughly cleaned out. If soft coal is being used this should be done at least once a week. A good draft cannot possibly be maintained if the boiler flues are allowed to clog up with soot.

The smoke pipe should slope upward from the boiler to the chimney and should have as few elbows as possible. Boiler should be placed as close as possible to the chimney.

Covering Pipes Saves Fuel

You will cut your fuel bills considerably if you cover all your heating pipes with pipe covering. Pipe covering comes in 3-foot sections. These 3-foot sections are split in half so they can be opened up and put over the piping after it is installed. It is a very simple job to apply this pipe covering. The most important thing is to be sure and select the right size covering for each piece of pipe. When you get near the end of the pipe a special piece can be cut from one of the sections with an ordinary hand saw to make the required fit.

The two halves of the covering are held together with cheese cloth flaps which are simply pasted down with ordinary cold water paste. After the covering is applied, put on the bands as shown in Figure 44.

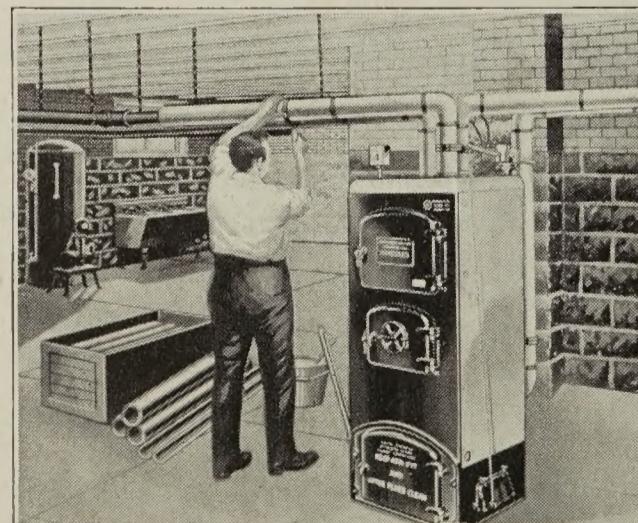


Figure 44
Showing how metal bands are used to hold pipe covering in place.

These lacquered bands are furnished with our asbestos pipe covering.

To cover the various fittings such as elbows, tees, etc., in the piping system, use regular asbestos cement. This can be applied with the hands and molded to fit the shape of the fitting.

After these various joints are covered the cement should be wrapped with muslin pasted down with hands, as this will protect the cement and keep it from dropping off. We strongly advise that you cover the pipes on your heating system as this covering will pay for itself in one or two seasons by the great saving which will be made in your fuel bills.

If your boiler is not jacketed, it should also be covered with asbestos cement to prevent heat loss in the basement.

Hercules Heating Systems